THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

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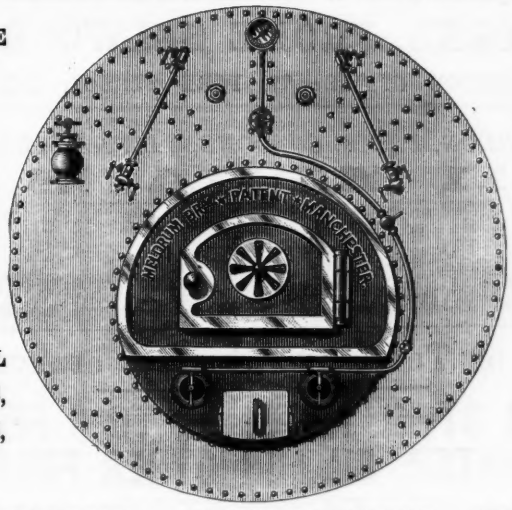

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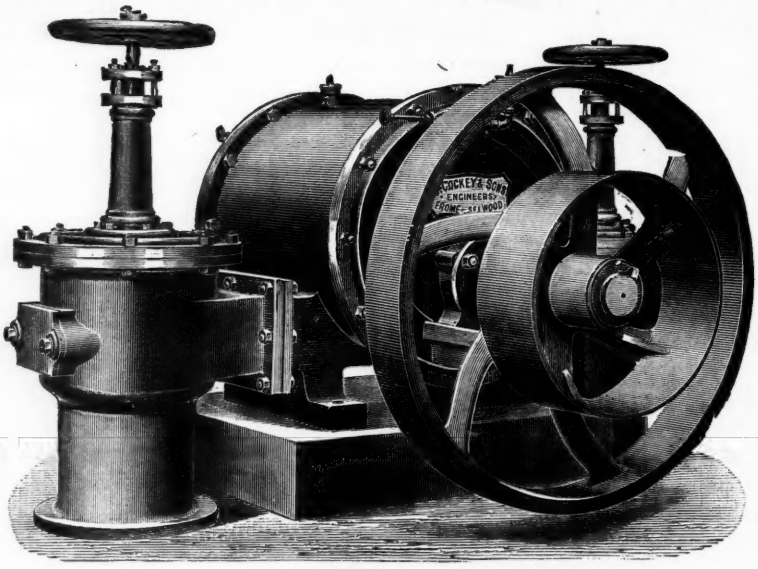

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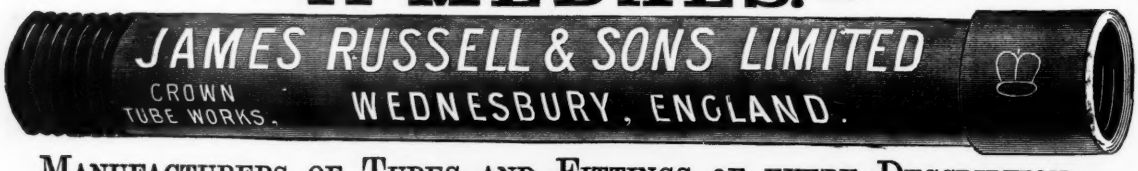

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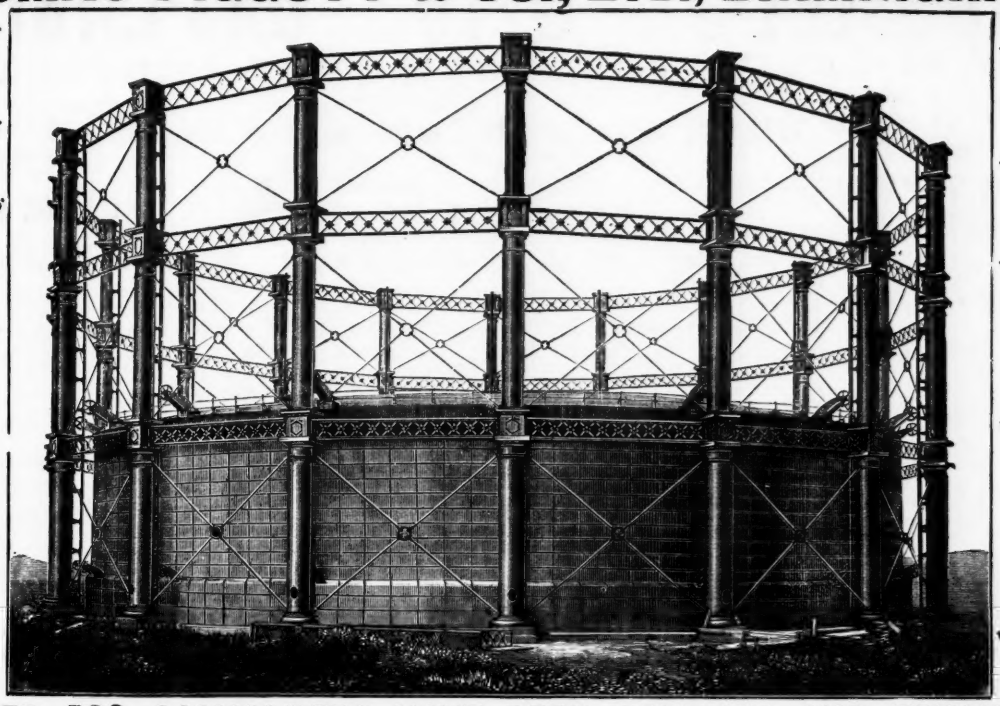

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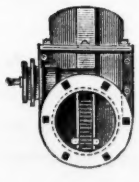

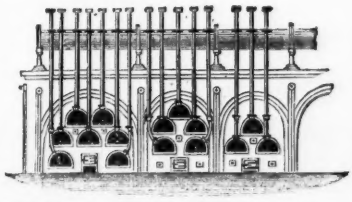

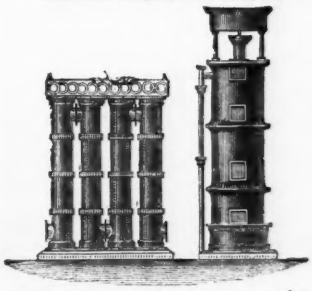

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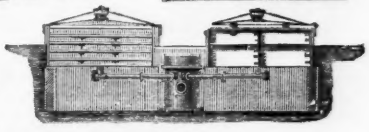

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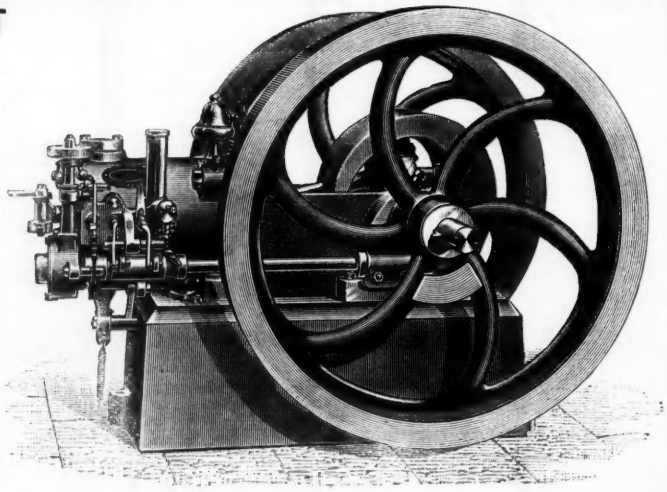

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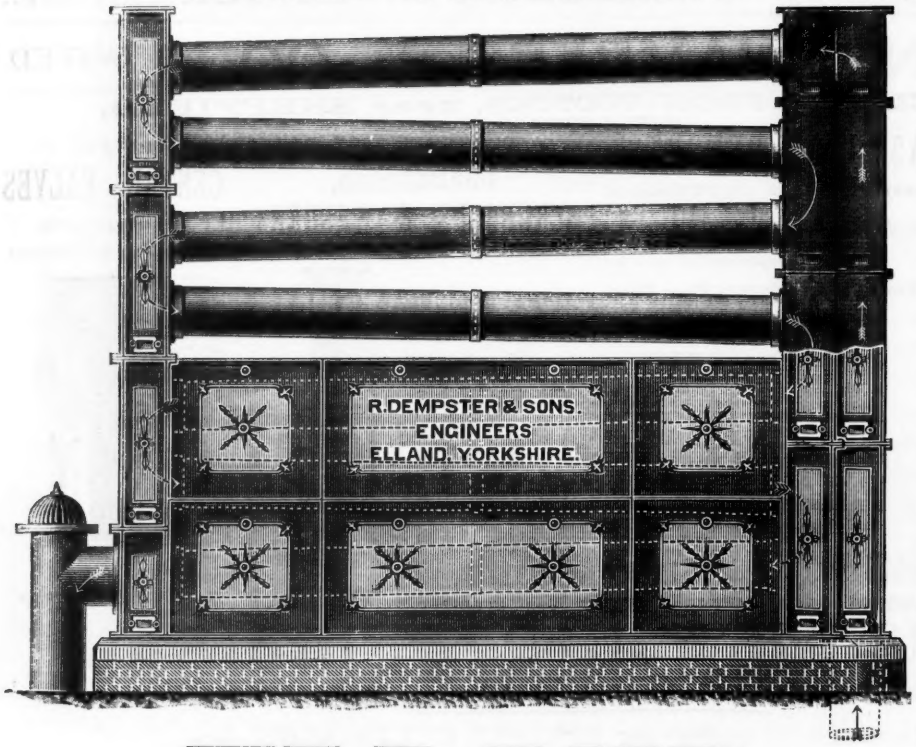

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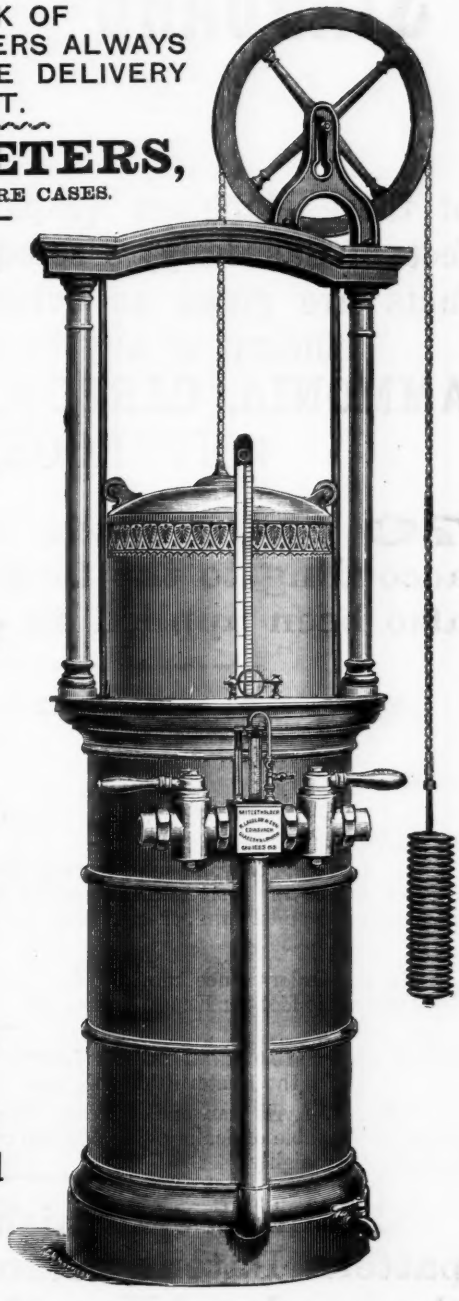

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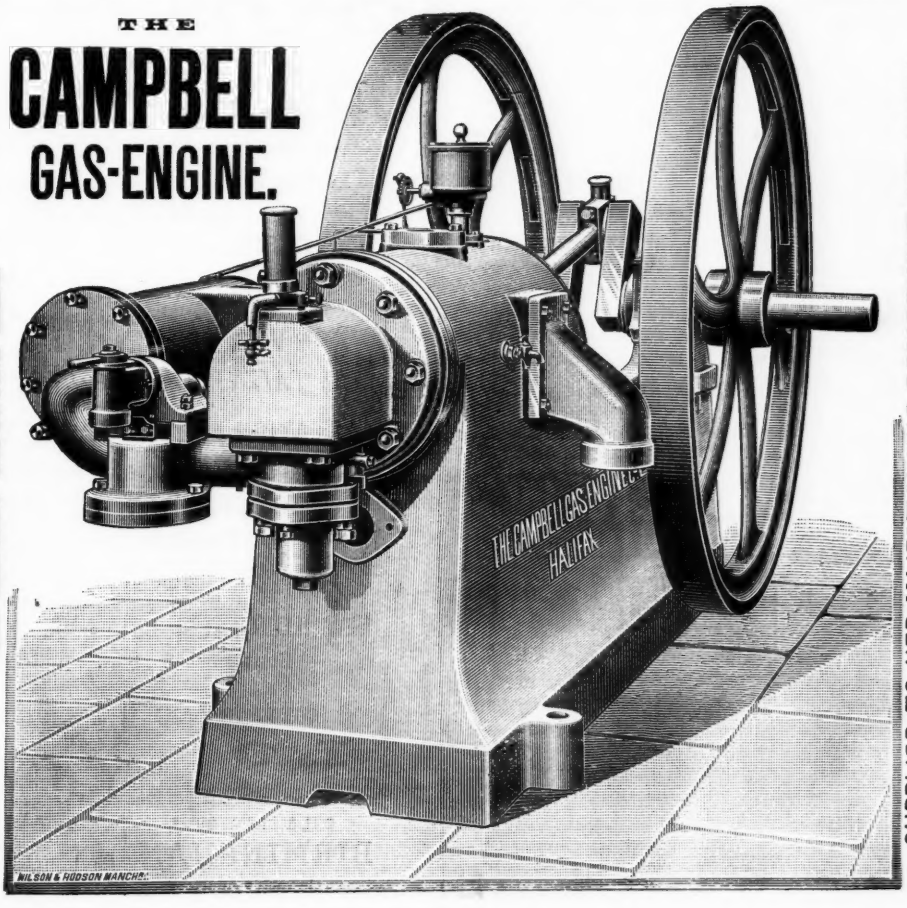

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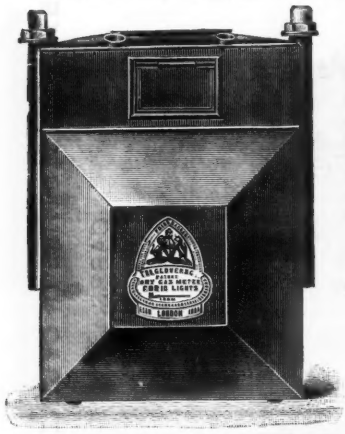

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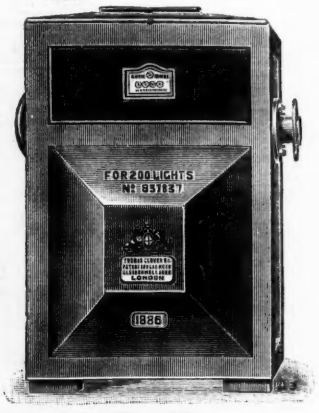

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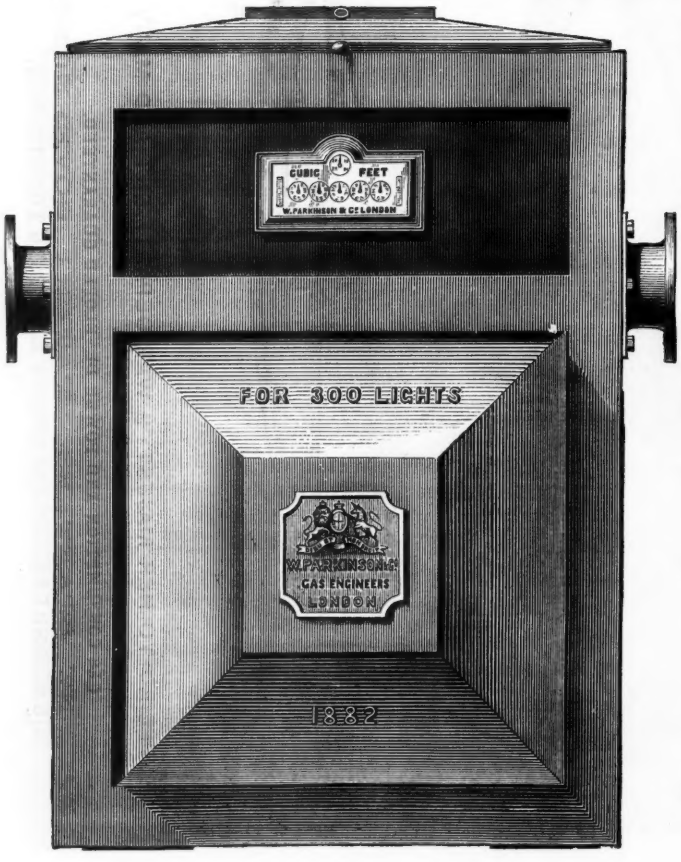

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TO ADVERTISERS.

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THE

JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, NOVEMBER 8, 1892.

The Result of the Appeal in the Gasholder Patents Case.

THE "glorious uncertainty of the law" has been once more exemplified in the result of the Gadd and Mason appeal; the strong judgment of Mr. Justice Kekewich in favour of the defendants in the original action having been reversed by an even stronger decision in favour of the appellants. It is hardly worth while to recapitulate the heads of this particular litigation, which must be familiar to all our readers. Suffice it to say that, when Messrs. Gadd and Mason took action against the Corporation of Manchester, in order to restrain them and all other users of gasholders from availing themselves of the wire-rope system of guide-framing perfected by Mr. E. Lloyd Pease, they failed on the ground that their patent, of which Mr. Pease's arrangement was alleged to be an infringement, was bad on several accounts, all of which were fully set out in our reports at the time. The Chancery Judge was assisted in coming to this decision by six days of conflicting argumentation by the leaders of the Bar, and of contradictory evidence of the most prominent professional experts, engaged at enormous expense; and now he is declared, upon superior authority, to have been entirely mistaken. Whether or not the matter will be carried any farther, and what the result of a possible invocation of the Briton's palladium—the House of Lords—may be, are things about which we cannot yet say anything. The proceedings in the case may be finished, or there may be another chapter to write respecting it; and consequently no comment upon the merits of the action can appear here in the meantime. We cannot retire, however, from the attitude we have already taken up in regard to this, in our estimation, utterly uncalled-for and ungracious piece of litigation. Looking at the matter solely in the general interests of the gas industry at large, it seems a pity that Messrs. Gadd and Mason could not have remained contented with the honour and the profit which they might reasonably claim, and hope to enjoy, as the reward of the uncontested ingenuity displayed in their spiral guiding invention, and have let Mr. Pease do the best he could with his wire-rope system, seeing that they work the one, and do not work the other. This is, of course, their affair: but while patentees must be allowed perfect liberty of choice in their interpretation of what is due to their legal position, they cannot expect everybody to agree with them, nor can they complain if their conduct is looked upon with disfavour out of doors.

This is, however, a sore point in the relations of most patentees with the public; and we shall not dwell upon it with special reference to the present case. It is but far to the winners (so far) in this protracted legal combat, to admit that the deliberate opinion of such shining lights of the Bench as Lords Justices Lindley, Lopes, and A. L. Smith, has held them justified in the action they have taken; and it is to be hoped that whoever is declared victor in the end will find the game worth the candle. For the present, we may be permitted to offer just a few remarks upon the case, as an example of the way in which the collective wisdom of our legal and engineering experts decides that questions concerning patent-right shall be tried out. Is it a rational way? To say nothing about economy—for warfare, whether in the form of litigation or after the more primitive fashion of physical conflict, notoriously takes no account of the economies—is it the best, or even a passably good way of ascertaining the rights of rival patentees that has been exhibited in this action, which has so conspicuously followed the type of all similar proceedings in the present day? No sensible man can answer such a question in any other sense than a strong negative. This was purely a lawyers' and experts' case throughout. The merits of the opposing interests were not so much as considered. The issues set before the Courts were narrowed down to the barest skeletons of what they were supposed to represent; and both sides were seen labouring for days, at fabulous charges, over definitions of words and interpretations of musty records of schemes that never took practical shape. Without discussing the substance of the judgment of the Appeal Court, we take leave to direct the particular attention of all concerned in this class of lawsuits to the weighty declaration of Lord Justice A. L. Smith, in which he scouted the idea that expert evidence is necessary for the interpretation of words in common use. If the spirit of this observation were acted upon, how much money might be saved to litigants, and how much of the precious time of tribunals might be redeemed for more profitable use! We say without hesitation that the "expert" system, at the pitch to which it has been carried in our day, is a scandal to the industrial community that ought to be cured, as it could be easily enough if litigants would not permit

themselves to be led away by the conventionalities which are eating like a canker into the judicial business of the country. Bench and Bar unite in lamenting over the distrust with which men of business regard the Courts; but if anybody wonders at the existence of this sentiment among men who have other and better uses for their means than contributing to the exaggerated incomes of the select coterie who find the system in vogue so profitable, such cases as the one we have been considering may be cited with convincing effect to show how such a feeling has arisen and is fostered.

Professor Lewes's Forthcoming Cantor Lectures.

THE good work done by the Council of the Society of Arts, under the wise direction of the Secretary, Sir H. Trueman Wood, in respect of setting forth the manifold problems that occur in the development of the scientific side of the coal gas industry, have often been acknowledged in these columns; and we have now again to express the gratitude of the whole gas engineering profession to the Administration of the Society for having devoted another series of Cantor Lectures to the treatment of a gas subject of great present interest. The lecturer will be Professor Vivian B. Lewes, Chief Gas Examiner to the Corporation of the City of London, who has succeeded in quite a phenomenal degree in the by no means easy enterprise of gaining the attention of gas technicians, and whose proved skill in handling the chemical and physical problems of gas production, analysis, and utilization warrant the expectation that his forthcoming course will be of more than average interest. The lectures, four in number, will begin on Monday, the 21st inst., and occupy the Society's theatre for the three following Monday evenings. We do hope that the members of the profession who may be in town on these dates will attend at John Street in such numbers as shall show the lecturer and the Society that their efforts to advance the scientific study of gas lighting methods are rightly appreciated. To assist in getting a proper audience for the lectures, we give elsewhere a synopsis of the subject-matters upon which Professor Lewes is to treat, as to the quality of which it is only necessary to remark that they bid fair to constitute a "liberal education" in the matter of the generation of light from coal gas. No young gas engineer or student of gas manufacture who can possibly attend a course of lectures of this character ought on any account to miss them; for it is as true as ever it was that the method of lectures is the best way of imparting information. Those who cannot enjoy the privilege of listening to the teacher's words, catching the expression that conveys as much as the letter, and following the experiments and illustrations which elucidate or confirm the spoken word, must perforce rest content with such printed reports of lectures as they can get; but this is, after all, a second-rate substitute for the living speech. The peculiar benefit of hearing a lecture delivered or a paper read, as compared with the perusal of a print of the same matter, goes further than the impressiveness of *vivâ voce* communications just mentioned. It is really a subjective phenomenon, and has reference to the activity of the hearer's mind, which is busy with its own reflections, questionings, and comments, all the time that the receptive quality is taking in the sense of what is heard and seen. Mainly for this reason, not all the printed books that have been or ever will be put into a student's hands can replace the lecture as a means of imparting instruction that is meant to take root in the mind, and bear fruit in due season.

"It's Ill Waiting for Dead Men's Shoes."

THE redoubtable Mr. John Burns, M.P., has been very much to the fore during the past week, advertising himself, as usual, as representing the "working man in "politics." We are only concerned to note here some remarks attributed to him by a newspaper reporter who interviewed the member for Battersea, in his capacity as a mouthpiece of working-class Socialism, respecting the most imminent developments of the Municipalism which seems to have become the guiding principle of the London County Council. It was a question of what industrial, or *quasi*-industrial, undertakings the self-styled Party of Progress in this body contemplate taking possession of in the name of the community. According to Mr. Burns, docks, tramways, water supply, electric lighting, and sundry other necessary appurtenances to communal existence in the present age, ought forthwith to be taken charge of by the London County Council, which body he, like others of his party, persist in regarding as a municipal organization, conveniently forgetting the Vestries, which at present do most of the municipal work of the Metropolis. Upon the question of the gas supply, however, Mr. Burns was gratifyingly candid. The County Council are not to meddle with it on any terms, because it is a moribund industry. This is eminently consoling for gas consumers in London. There is a story of a blunt Scotchman who, when his wife had been *in extremis*, as he thought, an unreasonable time, told her to "get on with her deeing." In the case of Lord Chesterfield, that mirror of the politeness of a past era apologized to his friends and attendants for being so unconscionably long in "shuffling off this mortal coil." The State of Turkey is, we all know, referred to in high Continental politics as "the sick man of Europe," whose executors are still wearily waiting for his demise, and the consequent "cutting up," as they have done for a century or more. All these instances of delay in dying are "galloping con-"sumption" itself in comparison with the present prospects of the rate at which the gas industry will approach its end. A growing industry, like a growing child, may come to a natural death during this stage of its existence; but hardly without premonitory symptoms of organic mischief declaring themselves to the experienced observer. To argue at length that we do not discover anything of the kind in regard to the gas industry, would be superfluous. It is more to the point that the Money Market remains content to underwrite the gas supply of British towns at a very reasonable rate of premium. It may be an idle fancy, but somehow we entertain the conviction, which no man living will survive to test, that the last of the coal supply of Great Britain will be more likely to pass through a gas-retort of some kind than be burnt under the boiler of an electric lighting plant.

The Thirsk Railway Accident—A Misleading Report.

THAT the recent terrible disaster to the East Coast Scotch express should have attracted all sorts of comments from the large order of the community which is "wise after the "event," is only what might have been expected. It is always so on these occasions. People who do not realize the fact that successful railway working, like many other common wonders of our present-day civilization, depends upon the perfect hanging together of an almost infinitely long chain of individual responsibility, always hasten to air in the newspapers their crude imaginings of how the particular door through which the "horse" happened to be lost might be more effectually fastened. And the first hasty report which spread of this Thirsk accident, containing, as it did, the statement, afterwards contradicted, that the wrecked carriages of the passenger train were set on fire by the compressed gas used for lighting them, was eagerly fastened upon by the enterprising gentry who never let slip a chance for vilifying gas lighting, and pegging in an advertisement of an "improved system of illumination" —meaning, of course, the electric light. We expected this; the previous incident of the Clapham Junction accident having established the *primâ facie* possibility of such a consequence of the wholesale wrecking of a railway train carrying a store of Pintsch gas, and only the slightest exercise of imagination by a reporter acquainted with the records of Transatlantic railroad catastrophes being necessary to impute this additional horror to the Thirsk disaster. As the facts have so far transpired, however, these ingenious exploiters of the "might have been" stand convicted of the error of having been "too previous" in their comments and vaticinations. That the express train, or a portion of its wreckage, was set on fire is true; but it is abundantly proved that the cause of this effect was the scattered cinders of the furnace of the locomotive, and that it was confined to the woodwork immediately contiguous to the engine. Unfortunately, a false statement of this character, when once started with a day's lead, is as difficult to overtake as an East Coast express itself in full career; and we suppose that many worthy people have by this time become fully persuaded of the idea that there is something specially dangerous in a gas-lit train. Now, this is doubly to be deplored; in the first place because it is an error, and secondly because its influence must work against the improved lighting of railway trains, which is so greatly to be desired. We hold no brief for the Pintsch Company or for those railway companies who have adopted their system, much to the comfort of their

passengers; but we ask anybody who may be disposed to regard an iron cylinder of compressed oil gas as a source of additional danger to passengers by a wrecked train, how much gas they may think likely to remain in the reservoirs, themselves incombustible, an instant after these have been punctured, or the smallest of their connections fractured. It should hardly need to be argued that the immediate consequence to the gas lighting of a train wrecked as was this particular express, must be the extinction of the lights; and the *débris* would, in such a case, be actually less inflammable than if the material of the splintered carriages were soaked with oil from overturned lamps. As to the electric lighting of trains according to the best known system—that involving the carriage of storeage batteries—it would only be necessary for an injured passenger or two to be blinded and scarred by spilt chemicals, to raise a louder clamour against the importation of this superfluous risk into railway travelling than that which is now being so factitiously manufactured out of an erroneous report respecting the misbehaviour of Pintsch gas.

A Weakness of the Age.

A VERY timely and weighty protest has been made by Professor Tilden, of the Mason College, Birmingham, through the columns of *The Times*, against the growing abuse of appending strings of initial letters to a surname, with the object of indicating to the credulous world that the person indulging in such a tail is a "somebody." Leaving out of account the recognized indices of the possession of University degrees, and of similar badges, such as the M.R.C.S., &c., which have a legal as well as a technical value, it is an incontestable fact that the vast majority of the abbreviations of scientific "titles," as Professor Tilden calls them, which are so lavishly used by many people, are devoid of real meaning, and, when not merely an indication of personal vanity, are designed to impose upon the credulity of the public. He points out that there are two classes of societies, associations, and institutes, in connection with the membership of which the employment of these "titles" has grown up. One class comprises the various corporations—chartered, or incorporated as by law provided—which, without possessing the monopoly enjoyed by the Royal Colleges of Physicians and Surgeons, or the Incorporated Law Society, yet occupy such a position with regard to the professions with which they are identified as confers some distinction upon those who are admitted to membership in them. Of such are the Institution of Civil Engineers, the Royal Institute of British Architects, and the Institute of Chemistry. The other class comprises the purely volunteer societies whose ranks are practically open to everybody who can get a nomination and find the necessary yearly subscription. It is these organizations that supply the wealth of initials that would-be distinguished individuals are so fond of attaching to their insignificant patronymics. Who does not know the man to whom his F.R.G.S. or his F.R.M.S., or whatever it is that he elects to draggle behind his signature, is as dear as his own flesh and bone? Professor Tilden does not mention the most ridiculous trick of all—the affixing of the letters C.E. after the name of him who chooses to call himself a Civil Engineer, and which does not even presuppose the fact of membership of the most trumpery of self-styled scientific associations.

Doubtless, a good deal of this assumption of a "title" on the part of nobodies is pure vanity, and corresponds to the weakness of human nature which breaks out in Western America in the mutual bestowal of complimentary military and forensic titles. Our common "or garden" F.R.S.E. would be "Colonel," or "Judge" in Colorado; just as in Italy he would be "Excellency," and in France would intrigue unceasingly until he obtained the magic red ribbon. The mischief of the practice arises when, as often happens, the user of these gratuitous "titles" essays, in a Court of Law or elsewhere, to secure undeserved consideration, or to obtain an appointment to office, by virtue of his display of these mystic appendages. The evil is patent; the question is how to neutralize it. We hold with Professor Tilden that the only practicable remedy is the rigorous abstention on the part of self-respecting members of societies and institutions from using these meaningless suffixes. Speaking of engineers in general, and for gas engineers in particular, we are glad to be able to claim that the trick is not a common one in professional men of the true strain. No Gas Managers' Association that we are acquainted with has issued to its members one of those unmeaning "diplomas" of fellowship which instigate to the use of a "title." In the case of the Institution of Civil Engineers, it is true that membership has some value; but the best members regard their association with the Institution rather as an honour than as a degree. It merely shows *primâ facie* evidence that a man is an engineer by training and profession; but it says nothing as to what sort of engineer he is in deed. To conclude this notice of a common weakness in men who feel that their names require dignifying in some cheap and handy style, we would venture to express the hope that Professor Tilden's protest will take effect where it is most needed; and that the simplicity of the old English character will reassert itself against the invasion of this foreign taste for alphabetical gewgaws.

WATER AND SANITARY AFFAIRS.

ONE of our contemporaries published last Saturday the substance of what is entitled an "important report to the "London County Council." The abstract given is a long one—partly in summary, and partly verbatim; the whole being invested with the dignity of large type. The subject treated upon has reference to the London Water Companies; and the original document is stated to be a report which "has just been made to the London County Council "by its Parliamentary Agent." We have no objection to be made acquainted with the plans and purposes of the authority which has its head-quarters at Spring Gardens. But we are rather surprised that a report of such gravity as this professes to be, should thus be laid open to the world without first appearing in the public proceedings of the body to whom it is addressed. In the nature of things, it is possible, though we do not say the event is a likely one, that the Council will reject the report, and proceed on some other lines. In short, we look upon the publication as irregular, and as constituting what is called a "breach of privilege." The Council will probably condone the offence, considering the quarter in which it has been committed. But what are we to say to the document itself, regarding it as having the character of an official report? It is described as dealing mainly with five questions. Yet they all concentrate themselves on the one grand consideration, as to the position of the London Water Companies in respect to their property. After a long argument in depreciation of the interests appertaining to the Companies, there comes the practical application: "It seems clear, then, that it would be a totally fallacious "idea to negotiate agreements on the assumption that all "the Companies possess a statutory monopoly, free from "competition, having a title in perpetuity to the amount "now levied by water-rate, with a prospective increase "of profits and not of obligations." To get the property of the Companies for less than its value is, of course, the grand object of the Council. The document to which publicity is now given reads to us rather like a manifesto, intended to anticipate the report of the Royal Commission. Among the verbatim extracts we read as follows: "How-"ever favourably the Royal Commission may report upon "the character of the Thames water, it is not conceivable "that the ratepayers of London will agree—or that "Parliament will force them—to pay for purchasing the "right of supplying this water on the same basis as if it "were water derived from an uninhabited watershed, and "free from risks of pollution." There seems to be an apprehension that the Royal Commission will present a report favourable to the present supply, and that Parliament will recognize the claims of the Companies as holding a valuable property. The County Council report—as we may venture to call it—discusses the effect likely to be produced on the purity of the stream by the action of barges, pleasure-boats, bathing, and manure spread on the adjacent fields. These matters are debated as if the opinion of the Royal Commission respecting them need not be waited for. In fact, the Commission blocks the way; and the County Council would, if it could, ride over it.

In treating of the legal position of the Water Companies, the report to which we have referred in the foregoing paragraph makes the extraordinary statement that the Companies taking their supply from the Thames "have not purchased any water of the river, and have no

"legal property in it," but are merely "permitted" to use it for purposes of supply, and this only to a limited extent. When we consider the thousands of pounds paid by these Companies every year to the Thames Conservancy Board, the idea that they are merely "permitted" to take water from the stream seems rather finely drawn. A startling assertion founded on the report is, that "the "Companies have never yet fulfilled the obligations im- "posed upon them." It is sufficient to say that no such default has ever been proved against them; but we may add that we never yet heard of any such charge being formulated. According to this delightful report, the Companies are simply "nowhere" in regard to the water supply. They have no "legal claim" to anything, whether it be income, jurisdiction, guarantee, or even water itself. The proposals of Sir Matthew White Ridley's Committee for purchase, either by agreement or by arbitration, within a fixed period, are set aside; and Sir William Harcourt's report of 1880 is declared to be "the most authoritative exposition" of the mind of Parliament on the subject. If anything is conceded, it is that the River Lea Companies have some part of the water of that river vested in them, though it is said to be "very doubtful how much." How the matter rests with regard to the Kent wells and other underground waters, we are not told. The final issue presented by the report is that, "if and whenever" the inhabitants of London, "through their County Council," demand the modification or revocation of the concessions made to the Companies, there is nothing that should hinder Parliament from allowing the inhabitants in question "to provide "themselves with a purer water supply." We would suggest that, if Parliament may first make concessions and afterwards "revoke or modify" *ad lib.*, this had better be understood beforehand, and capitalists generally will know what to expect.

At the half-yearly meeting of the West Middlesex Water Company held last week, and reported in another column, the Chairman (Sir W. H. Wyatt) mentioned three points of importance in respect to the Royal Commission on Metropolitan Water Supply. In the first place, the Companies could get no information as to what would be required by the Commission, and consequently had to prepare evidence of every kind—not knowing what might be wanted. In the next place, the expense involved in laying evidence before the Commission was very large, and was aggravated by the uncertainty mentioned. It is somewhat startling to find that the Directors of the West Middlesex Water Company have thought it necessary to put down their expenditure on this account at no less a sum than £3200. A third point consists in the apparent success with which the Companies have defended themselves before the Commission. It would certainly appear that, if failure exists anywhere, it is not on their side, but rather on the part of their opponents. At least it may be safely averred that the Water Companies have not been in the least damaged, but rather benefited, by the inquiry. Sir W. H. Wyatt considers that nothing has been proved against the quality of the water. Neither has anything been adduced to show that the Companies, "if let alone," would not be able to provide sufficiently for all the demands of the future. Such, at least, are the views entertained by the Chairman of the West Middlesex Company. In respect to the question of quality, we may here, perhaps, refer to the letter from Mr. Crookes and Dr. Odling, published in *The Times* on Wednesday, in reply to the communication from Sir Spencer Wells, to which we made allusion last Tuesday. Mr. Crookes and Dr. Odling express their belief that, in conjunction with the scientific friends with whom they are associated, they will be able to lay before the Royal Commissioners such a body of facts and considerations as will satisfy them that not even a suspicion—certainly not a reasonable suspicion—attaches to the present water supply as likely to produce or spread epidemic disease. Sir Spencer Wells has stated that epidemics like cholera and typhoid fever have been traced "with absolute certainty" to infected water supplied by the London Companies. Mr. Crookes and Dr. Odling say, in response, that if Sir Spencer Wells refers to filtered water furnished by the Companies from their present sources of supply, he should place the evidence of these results before the Royal Commission. We would here ask: Supposing Sir Spencer Wells cannot produce the evidence, will he withdraw the assertion?

ESSAYS, COMMENTARIES, AND REVIEWS.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 829.)

THE course of business on the Stock Exchange during the past week has been quite uneventful, and presents scarcely a feature of any interest. The prevailing expectation in the earlier portion of the week was that there would be a rise in the discount rate on Thursday; and this kept things quiet generally. When the day passed, however, without any change being made, there was no outburst of activity; so that in the aggregate business has been restricted altogether. The Money Market even now presents an element of uncertainty; for there is no forecasting when the next change will be made; so much depends upon foreign operations, which are quite dark at present. The Gas Market has only been moderately active; and changes in quotations are few and far between. They are also somewhat irregular—the principal open stocks being only about steady; while the more secured issues showed signs of improvement. Taking this in conjunction with the general quietude in most other markets, it looks as if the public were still very much disposed to be cautious, and to stick to the higher priced, but safer, investments. Gaslight "A" was very steady—opening and closing at about 219½; and only ranging about a point above or below at any time in the week. The secured issues of all sorts were more than proportionately active, and commanded very good prices; but the only actual advance was a rise of 1 in the 6 per cent. debenture. South Metropolitans looked like more than maintaining their ground, and transactions were marked at better than the nominal quotation; but the latter was left standing. A few bargains were marked in Commercials; but the figures were not remarkable. Suburbans and Provincials were very quiet; but a couple of changes in value took place—Bristol rising 1½, and British receding 1. The Continental Companies were fairly brisk—especially Union—and generally disposed to be steady, though Imperial fell back 1. None of the rest did anything noticeable. The Oriental Company's accounts show that they are doing good business; so that, in spite of the adverse exchange, they are able to maintain their dividend. Monte Video declares an interim dividend of 2½ per cent. for the first half of the year. None of the Water Companies were active, except Lambeth; and all were steady save Southwark.

The daily operations were: Gas opened unchanged on Monday, and remained quiet and steady all day. Tuesday was a close holiday. Briskness characterized the reopening on Wednesday; but prices were not particularly good, though Gaslight 6 per cent. debenture rose 1; and Bristol, 1½. British fell 1; and Southwark Water did the same. On Thursday, South Metropolitans furnished the best business, and changed hands at good figures; but quotations did not move. Friday was about an average day; but prices were not remarkable either way, and quotations held on. Saturday was noticeable for business done in the secured issues of Gaslight. The only variation was a fall of 1 in Imperial Continental.

ELECTRIC LIGHTING MEMORANDA.

The Comparative Cost of Gas and Electric Lighting—The Prospects of the Central Station Companies—The Progress of Electric Lighting in the City of London.

THERE has been a very pretty quarrel among the members of the Islington Vestry respecting the recommendation of the Electric Lighting Committee of this body to instal in the parish a *replica* of the central station with which Professor Robinson has provided the adjoining parish of St. Pancras. It is complained that the Committee dropped into Professor Robinson's hand like a ripe pear, seeing that their report, which was supposed to enlighten the Vestry upon the whole question, is merely a presentment of Professor Robinson's views and opinions. Among other things, it is asserted that the Islington Committee have allowed themselves to be deceived respecting the comparative cost of gas and electric lighting by Professor Robinson, whose figures relating to this vexed point were roundly called in question three months ago by the *Electrical Review*. Our contemporary deserves respect for its practice of telling the truth on a matter about which most electrical partisans have entered into a conspiracy to deceive the public. It holds, very rightly, that it is bad policy to trick people into becoming users of electric light by telling them that it will cost less than will be found out by their bills; and, accordingly, it denounces as misleading Professor Robinson's statement that the cost of the electric light is nearly the same as gas where the current is charged at about 5d. per supply unit. Of course, the Professor could not rest mute under this charge; and he has endeavoured to justify his assertion—only, however, making matters worse. He maintains that his statement is correct, upon the basis of both the incandescent lamps and the gas-burners being new, which he declares to be the proper way of approaching the problem. This position is assailed by his critics, who argue that, "to the man who has to pay the lighting bills for several years to come, the relative

efficiency of the two systems during the first two or three days' working is a matter of very small importance." But the case of the *Electrical Review* does not rest upon this point; and it shows, taking the example of a flat-flame gas-burner giving the light of 12 candles, and consuming 4·6 cubic feet of gas per hour, that, to compare on equal terms as regards cost with ordinary coal gas so employed, "the unit must be sold at about 4d. or 3½d., according to whether the cost of renewals is left out or included."

The prospects of central station lighting companies, wherever situated, are not brightened by the state of affairs revealed in the foregoing paragraph; for none of these undertakings can expect to sell electricity at 4d. per unit, or thereabouts, and live. Yet this is actually more than incandescent electric lighting costs in certain circumstances, according to statements which deserve attentive consideration. Mr. Magnus Volk has for some years been working an electric railway at Brighton, using a 12-horse power "Otto" gas-engine and a Siemens dynamo; both machines being of the type of 1885. As the price of gas is 2s. 7d. per 1000 cubic feet, it is found that the cost of gas per unit generated is 2·8d. in all. In other words, 12·1 units are obtained from 1000 cubic feet of gas. Again, speaking at a shareholders' meeting of the Safe Deposit Company a few days since, the Marquis of Tweeddale stated that, since the Company had taken to lighting their City premises by means of electricity generated by a gas-engine, they had saved upon their former lighting bill. This is putting it rather strongly; but it does not appear to admit of dispute that, in large establishments, a unit of electricity can be generated by gas power, at the prices prevailing in this country, for something like 3d. This being so, the central station lighting companies which can only sell electricity at double this price and upwards, will have to rest content with seeing their best possible customers starting independent plants.

We believe that the progress of electric lighting in the City of London at the present time is mainly along the line of private installations. Week after week the electrical journals contain paragraphs setting forth the amount of work that the leading firms of electrical fittings contractors—among whom the principal gas-fitting houses are not the least conspicuous—have in hand in London and the provinces. Most of this work is in connection with private generating plant, involving the use of gas-engines. This is not a consideration that need trouble the manufacturers of gas; seeing that, as a rule, a house that starts a plant of this kind burns more gas than it did before. Indeed, when accumulators enter into the scheme of such an installation, the result is distinctly beneficial to the gas company, seeing that in this case the gas is required mostly during the day. But the consideration of these private installations, removing as they do the largest houses out of the reach of the public supply companies, has a very serious side for the latter. Banks, warehouses, markets, commercial establishments of every kind, are taking freely to electric lighting; and the money is being spent right and left in handsome fittings. So far as the experience of the fittings contractors goes, the amount of work doing, if not that of profit made, recalls the palmy days when gas was making even more rapid headway; but the public lighting companies are not pocketing much profit, nor are they inscribing fresh customers upon their books in such numbers as they would desire. The Metropolitan electric light companies, and the principal provincial ones also, do not touch fitting work; and rumour has it that the new services they are putting in are principally for small consumers, who would not find it worth their while to lay down installations of their own. It will take a good many of these 10 and 20, or even 50 light customers, pretty thickly planted, to pay for the capital sunk in the supply company's works and mains; and, meanwhile, the rich banks, clubs, and insurance offices—just the customers, in short, who could best support these particular companies without feeling it in the slightest degree—will be blazing away their own lamps, and paying their gas bills just the same as of yore. This is, at any rate, a fair picture of how things are going at the present time in the City of London.

Death of Mr. John Tawse, of Edinburgh.—We learn that Mr. J. Tawse, who was for some years a Magistrate of Edinburgh, died a week ago. Mr. Tawse was not unknown in the gas world, having been, at the time of the transfer of the Edinburgh and Leith gas undertakings, Chairman of the Edinburgh and Leith Gas Company. He was a keen business man; and it was largely through his exertions that the Company obtained the favourable terms they did.

The Engineering Features of the Houses of Parliament.—The current number of our enterprising contemporary *Industries* is rendered unusually interesting from the fact of its containing an illustrated description of the engineering features of the Houses of Parliament. Special facilities were afforded for making as complete as possible the account there presented of the lighting, ventilating, heating, and drainage arrangements of the Palace of Westminster; and, in order that the latest improvements might be included, the publication had to be delayed. We cannot do more to-day than record its appearance; leaving any extended notice of the production till some future occasion.

NOTES.

What becomes of Retort Carbon.

A description of the manufacture at Nuremburg of electric light carbons from gas-retort "graphite" has been given in the form of a report by M. Leon Duplessis, the French Vice-Consul in this ancient town. It is not stated how this manufacture became a Nuremburg specialty; but six large factories are at present devoted to it. The retort carbon is only used for making solid carbons. It is first broken by means of a stamp mill into small nuts; the broken material being sifted, and the larger pieces crushed and rolled until the desired degree of fineness is attained. The powder is then mixed with a binding material, puddled, and the paste forced through dies which give the ultimate form of the carbons. The rods so formed are then submitted to hydraulic pressure, and are finally baked in furnaces where the temperature occasionally rises to 2000° C. After this, the carbons only need cutting into lengths to be fit for the market. This is a curious account of the use that is made of a gas-works "residual" which no gas manufacturer would ever produce if he could help it, irrespective of the consideration that it is a convenience to a rival industry.

Photometry by Phosphorescence.

Yet another kind of photometer has been suggested for industrial use; the principle being based upon the phenomenon of phosphorescence, which up to the present time has not been made use of for any practical object. The suggestion is due to Professor C. Henry, who has recently drawn the attention of the members of the Académie des Sciences to the possibility of using for photometrical purposes the phosphorescence of zinc sulphide obtained from the sulphate. Hitherto phosphorescent bodies have been regarded as useless for any such purpose, as none of them has been prepared from pure materials; and many of the substances which exhibit this quality are of indefinite chemical constitution. Pure zinc sulphide, however, is a definite compound, and can be reproduced at any time. It also possesses the important property of being permanent under the action of light, or when exposed to the air. Professor Henry's experiments have led him to think that something may be done in the way of photometry, with sulphide of zinc, at any rate for industrial uses, even if it does not contain the essentials of a scientifically accurate standard. As against this, however, it may be remarked that there are already plenty of makeshift photometers in existence; and what science wants in this regard is an instrument of precision.

The Production of Cyanides.

Reference is made in *Industries* to a method for the manufacture of cyanides, which is stated to be of German origin, but no name of the discoverer or patentee is given whereby the information might be traced to its source. The process is described as consisting in leading nitrogen and coal gas (deprived, so far as possible, of its hydrogen) over the anhydrous oxides of the alkaline, or alkaline earth metals, raised to a white heat. The nitrogen is prepared by passing air over heated copper, and storing it, while coal gas is led over the resultant copper oxide, whereby it is claimed that the hydrocarbons of the paraffin series are deprived of a portion of their hydrogen (all the hydrogen being absorbed by the cupric oxide), and are converted into hydrocarbons richer in carbon, such as anthracene. The resultant gas is dried and purified from carbonic acid by passing through lime; and the copper, being reduced, is ready for the preparation of more nitrogen. The anhydrous alkaline, or alkaline earthy oxide, is obtained by heating an intimate mixture of the dried carbonate, carbon, and lime in a closed cylinder, which can be exhausted by means of a pump, which draws off carbonic oxide and leaves anhydrous oxides. The former can be used for heating purposes. Finally, the nitrogen and the hydrocarbons as above are led over the anhydrous oxide heated to whiteness; the operation being conducted under slight pressure. Iron, nickel, or cobalt in a granulated state may be added, to help in decomposing the hydrocarbons, and aid in conducting the heat through the mass. Our contemporary remarks that, assuming the reactions to occur as stated, the process seems ingenious; "but the light-hearted way in which the use of a 'white heat' for carrying on an operation in retorts [is spoken of] augurs a certain want of acquaintance with practical obstacles."

Cement for Pipe-Joints.

The use of Portland cement is recommended for steam joints, and is said to answer every purpose, besides being exceedingly cheap. Herr Adolph, of Mayence, is putting upon the market packing-rings made of cotton tubing filled with cement, in assorted sizes. These can be used for making manhole and other flange joints by the simple process of wetting them thoroughly, laying them in place, and screwing up; taking care to keep a uniform pressure over the whole ring. A still cheaper joint can, however, be made with neat cement alone; the cotton casing being superfluous. It is only necessary to gauge the cement into a thick paste with water, until it is of such a consistency that when daubed on a vertical wall it neither falls off nor flows down. The flanges are to be cleaned of grease and dirt, and the cement applied evenly, in quantity according to the area to be covered. The joints thus made are to be screwed up carefully until the thickness is reduced to about ⅛-inch, when they are to be left for the cement to set.

The screws are then finally tightened, and the edges of the joint plastered over with a little fresh cement, which two or three hours after is wiped over with a wet cloth or brush. Socket joints can be made in the same way.

A Test of a Locomotive Boiler.

In the course of their steam-boiler experiments, Mr. Bryan Donkin, jun., and Professor Kennedy tested the performance of a locomotive engine boiler, belonging to the Great Eastern Railway Company—first as a stationary engine and boiler, and afterwards while running from London to Lynn and back. The boiler was of the usual type, with copper fire-box and 223 tubes. The results obtained furnish a useful record of the capabilities of this kind of steam generator, while developing from 120 to 140 indicated horse power. Combustion was assisted by the blast of the exhaust; the air being about twice the bulk theoretically required. The equivalent evaporation was about 13 lbs. of water per pound of pure and dry coal. Of the heat evolved from the coal, reckoned as pure and dry, about 80 per cent. went in heating and evaporating the water, and from 15 to 18 per cent. in the furnace gases. Radiation only accounted for about 3 per cent.; and the loss by imperfect combustion was less than 5 per cent.

Death of Mr. Henry J. Marten, M.Inst.C.E.—We regret to announce the death of Mr. Henry John Marten, M.Inst.C.E. The deceased was an authority on questions of water supply; and, in conjunction with Mr. Henry Rofe, M.Inst.C.E., was the projector of a scheme for the construction of a series of storeage reservoirs in the Thames basin for improving the water supply of the Metropolis. Particulars of the scheme were given in a report made a short time ago by the above-named gentlemen to the Conservators of the River Thames; and their plans were fully explained by them to the Metropolitan Water Commission. Mr. Marten was until quite recently engaged in his professional work; his evidence before the Commission having been given about a month ago. He died at his residence, near Wolverhampton, on Thursday last, in his 66th year.

Society of Arts.—The first series of Cantor Lectures in the forthcoming session of this Society are to be delivered by Professor Vivian B. Lewes, F.I.C., F.C.S., at the rooms of the Society, John Street, Adelphi, on the evenings of the 21st and 28th inst. and the 5th and 12th prox. The opening lecture will be devoted to an experimental review of the researches made during the past century upon flame and its luminosity; special attention being given to the work of Sir Humphry Davy, and to the investigations which took place between 1820 and 1860. The labours of Frankland, Stein, Heumann, Soret, and Burch will be dealt with in the second lecture; and the chemical changes which take place in a luminous flame will be demonstrated. The existing theories as to luminosity, the genesis of the gas-burner, and the various type of these appliances now in use, will be considered in the third lecture. The subjects of the concluding discourse will be the effect of the constituents of the atmosphere on the light emitted by flames, the probable limit of the illuminating power of gas, and photometry. The lectures will commence each evening at eight o'clock. Among the papers to be read during the session (which will open on the 16th inst. with an address from Sir R. E. Webster, Q.C., M.P., Chairman of the Council) will be one on "The Detection and Estimation of Small Proportions of Inflammable Gas or Vapour in the Air," by Professor Clowes; and one on "The Purification of the Air Supply to Public Buildings and Dwellings," by Mr. W. Key, formerly Superintendent of the Tradeston Gas-Works, Glasgow.

American Gaslight Association.—The last number of the *American Gaslight Journal* to hand contains a short account of the twentieth annual meeting of the above Association, which took place in Boston (Mass.), on the 19th and 20th ult., under the presidency of Captain W. H. White, of New York. Pending the publication by our contemporary of the official report of the proceedings, an abstract of which will, as usual, be given in our columns, we may record that, though the number of papers was rather small, the meeting was, on the whole, an excellent one. When the roll was called on the morning of the first day, it was found that the number of members was 153; there being 42 new ones. After the report of the Council had been disposed of, we learn that the Association listened in "glum silence" to the report of the Special Committee appointed last year to consider the best way of representing the gas industry at the great Chicago Exhibition in 1893, and that they accepted the inevitable in a spirit of "grim resignation." A cordial vote of thanks was passed to the Committee for their services. The President's address was well received. He paid a suitable tribute to the worth of the late Mr. M'Ilhenny, whose death we announced last week, and who was one of the founders of the Association. Three papers were read on the first day; and they gave rise to well-sustained discussions. On the following day the remaining papers were disposed of; and the "question-box" proved more than ever fruitful of information. A spirited debate arose on the all-important question of next year's meeting-place; and the advocates of Chicago finally carried the day. The new President is Mr. A. E. Boardman, of Macon (Ga.). The business was followed by the usual banquet; and a steamboat excursion fittingly brought the gathering to a close.

COMMUNICATED ARTICLE.

THE UTILIZATION OF WASTE STEAM IN GAS-WORKS.

By Norton H. Humphrys, Assoc.M.Inst.C.E., F.C.S.

Although the days when tangible matters, such as tar and ammoniacal liquor, were allowed to run to waste have been ended, and gas-works can no longer be charged with polluting neighbouring watercourses or wells with soakage from purposely leaky tanks, there is yet a great deal of waste, in the form of heat dispersed into the air by the medium of the products of combustion from the retort-house chimneys, and of steam from the engines. The chimney heat is said to do some useful work in the way of creating a draught; but the time will come when the necessary air supply to the furnaces will be maintained in a less cumbrous and extravagant way. The exact manner in which this is to be done remains to be discovered; but there is one direction in which economy is within the reach of all, and that is by condensing the waste steam. Though this has been practised for some years past, by users of steam on a large scale, I believe there are still many gas-works where no trouble on this head has been taken; and in small gas-works the dogma that "steam condensation does not pay," finds general acceptation. There are some exceptions, it is true. One of these is the procedure of my friend Mr. Joseph Phelps, of Marlborough, who utilizes the waste steam from the gas-works in a very elegant manner, by applying it to the heating of a vinery and hothouse in his garden, adjoining the works. Some to whom I have mentioned the subject have appeared to regard it as one of those hobbies—pretty on paper, but profitless in practice—with which persons of scientific tastes are commonly, and not altogether undeservedly, credited. So a few remarks on the practical carrying out of this idea may not be out of place, especially as it has now been in actual operation for two or three years, with satisfactory results.

A description of feed-water heater, in which the latent heat of the steam used in the engines is turned to account for heating or raising the temperature of the water supplied to the boiler, will be found in most of the books devoted to the subject of boilers and engines. One of the simplest forms is a coil of piping placed in the feed-water tank, through which the waste steam is caused to pass; and this is sometimes replaced by a cylinder of wrought iron. Where water for the boiler is not stored, but pumped or allowed to pass direct from a permanent supply, a cylindrical jacket of cast iron is fixed on the waste-steam pipe, and the feed water is passed through it. The exact form of apparatus to be adopted must be decided by the circumstances in each case. The chief point to be remembered is the necessity for a large extent of surface, so as to make the condensation as complete as possible. In the particular example now under consideration, the condenser consists of an upright cylinder of stout iron plate, with cast-iron ends, supported on feet a few inches from the bottom of the tank. A large number of lengths of ordinary wrought-iron steam tubing, 1½ inches in diameter, pass through from end to end, and are secured like the tubes in a locomotive boiler. A pipe entering at the top introduces the waste steam, and one leading off from the bottom enables the condensed water to flow off together with the remaining steam, if any. The tank consists of an old 8-feet purifying box, and is about 4 feet in depth; while the cylinder is 3 feet high by 3 feet in diameter. It is entirely submerged in the water—the top being a few inches below the surface; and standing in the centre part of the tank, it induces a continual circulation of water. The heated water at the upper part of the tubes is displaced by the cooler water at the bottom. The supply is taken to the bottom of the tank and the outlet to the pumps from near the top. The extent of condensing surface, which includes the exterior of the cylinder and the interior of the tubes, is about 60 square feet—as much as would be afforded by 40 feet of 6-inch piping. The cost of a coil of pipes presenting an equal extent of surface was ascertained, and found to considerably exceed that of the cylinder.

This arrangement raises the temperature of the feed water to the boilers something like 100°, and would bring it up to nearly boiling-point but for the fact that there is a considerable loss of heat from the exterior of the store-tank. It was thought that, if this were prevented, trouble would arise with the plunger pumps that force water into the boilers. At the same time, a large quantity of condensed water, of a somewhat lower temperature, is obtained. The advantage of the heated feed supply is an economy of nearly 10 per cent. of fuel. This of itself is not of much importance, as the refuse screenings from the yard are used under the boilers. But it also means 10 per cent. saving in the stoking labour, which is an item well worth considering. Another important point is that the steam pressure is not reduced by letting in water, as was the case when cold water was supplied—a great practical advantage for more than one reason. The water used is very hard, and the result of warming it is to throw down in the feed cistern a portion of chalky matter which would otherwise go into the boiler. It is very easily removed from the former, but not so readily got rid of from the latter.

The numerous uses to which an ample supply of warm soft water can be put on a gas-works need not be particularized

here. It is amply appreciated by the workmen, and also by neighbouring residents; so much so, indeed, that it was found necessary to make a stringent rule that no water should be carried off the works. An objection to the use of hard water for the purpose of flushing out seal-boxes or connecting-pipes is the fact that the ammonia salts present in ammoniacal liquor exert a softening effect on the water, and a chalky deposit or precipitate is thrown down. This forms a considerable portion of the sediment that accumulates in large liquor wells. Trouble is often experienced in washers from the same cause. The chalky deposit collects in the perforations or narrow spaces provided for breaking up the current of gas—thus gradually reducing the efficiency of the appliance until a complete stoppage results. Some of the sediment, however, may get safely through the washer and the tar-well to the sulphate boiler or still, where it is deposited with the usual objectionable results. It was therefore thought that, if the condensed soft water was used for the washer, and for the general purposes of flushing, &c., there would be no risk of chalky deposits. The result of applying it in this way has fully borne out the anticipation. The washer works more freely; and as the chemical activity of pure water is much greater than that of spring water, its efficiency is increased in a marked degree. One way in which the trouble caused by the chalky deposits might be prevented was suggested to the writer some time ago. This was the use of the spent liquor from the sulphate works for supplying the washer. When soda or lime is not used, the spent liquor contains a few ounces per gallon of fixed ammonia salts; and it is a question worth consideration whether, by repeated use, these might not accumulate to a sufficient extent to make their extraction a successful commercial operation. There is the objection that, being already partly charged with soluble matter, a certain proportion of the solvent power of the water is thereby locked up or rendered latent; but the practical importance of this is a matter that could only be decided by experiment.

A New Method of Brick Manufacture.—At a recent meeting of the Paris Academy of Sciences, a paper was read on "A New Method of Brick Manufacture, used in certain parts of Central Asia," by M. Edouard Blanc. This mode of manufacture is practised by the tribes in Western Mongolia, on the frontier of Siberia. The extremes of temperature experienced there render a brick of great durability a necessary of life; and the quality is attained by the use of steam. The oven is cylindrical and surmounted by a hemispherical cap, which is kept open for the first three days. The bricks, about 7000 at a time, are baked by means of a fire fed by about 7000 kilos. of an annual ligneous plant, the *Alhagi camelorum*. On the third day, the opening is closed with felt, which is kept constantly wetted, so that the bricks are enclosed in a steam bath, while kept at a red heat. Under these circumstances, some novel chemical reactions take place. The bricks, red after the first period, are dark grey after the second part of the process. Their structure appears porous; they become sonorous, and acquire great hardness. Made from the same clay as English bricks, they resist weathering very much better.

Coal in Japan.—The actual and prospective importance of Japan as a coal-producing country is indicated in a report on the trade of Hakodate, compiled by the British Consul there (Mr. J. C. Hall), which has just been issued. The chief source of wealth in the comparatively infertile island of Yezo is coal. Fifteen years ago it was estimated by the American engineers who made the first surveys for the Japanese Government that the workable coal-beds of Yezo contained 150,000 million tons, or about two-thirds as much as the coal-beds of Great Britain. Doubts have sometimes been expressed as to the soundness of this estimate. An elaborate Japanese report, embodying the results of the most recent surveys, was published in March this year. From this carefully-compiled official document, it appears, as the result of actual surveys just completed, that there are, in the workable seams, upwards of 600 million tons of coal; the total for the rest of Japan being 700 million tons. Of the Yezo coal, nine-tenths are found in one district—that of the valley of the Ishikari River, near the west coast; the remaining tenth being scattered over five fields, of which the most important, that called Rumoe, in the province of Teshiwo, lies quite close to the coast on the same side of the island, just north of the head waters of the Ishikari River. Then come the Soya field at the extreme north of the island, and the Kushiro on the south-east coast, each containing 10 million tons. The first coal mined in the island, at Iwanai, in the province of Shiribeshi, belongs to the smallest of the six coal-fields—containing barely 2 million tons. As regards the quality, although it is very uneven, and none of it stands in the front rank of Japanese coal, still it is all marketable, and some of the better-class mines in the Ishikari field—notably those of Horonai, Ikushumbetsu, and Sorachi—yield a coal not at all inferior to the product of the Kiushiu Mines; the famous and fast-dwindling Takashima alone being excepted. Though found in comparatively recent geological strata, they are true bituminous coals, equal in commercial value to Australian coal. Taking them all round at the low average of 6s. per ton, it appears that the value of the coal treasures of Yezo is close upon £200,000,000.

TECHNICAL RECORD.

MIDLAND ASSOCIATION OF GAS MANAGERS.

In the JOURNAL last week, we published a report of the general business at the quarterly meeting of the above Association held in Birmingham on the 27th ult., under the presidency of Mr. W. LITTLEWOOD, of West Bromwich. We to-day complete our account of the proceedings by giving the discussions which then took place.

MR. HACK'S PAPER ON "ELLIOTT'S PROCESS OF CONTINUOUS CARBONIZING."*

The PRESIDENT said the discussion on Mr. Hack's paper was deferred till the Committee had investigated the process referred to therein at Mr. Elliott's own works. They were desirous of taking the matter up as soon as possible after the reading of the paper. But it was not convenient to Mr. Elliott for the Committee to visit his works; and therefore there was no report to present. He would, however, call upon the Secretary to read some correspondence which had passed on the subject.

The HON. SECRETARY (Mr. C. Meiklejohn, of Rugby) said the members would remember that, at their meeting in March last, Mr. Elliott was present; and he (Mr. Meiklejohn) afterwards wrote to ask him if the Committee could go down before the Rugby meeting. He wrote again on the 1st of July, and asked for a definite answer as to the Committee visiting the works, or whether Mr. Elliott would like the discussion to take place on Mr. Hack's paper as the matter then stood. To this, however, he had received no reply up to the present time.

Mr. C. HUNT (Birmingham) remarked that, while they could not but regret that the opportunity which was to be afforded them of further investigating this process had not been given, it appeared to him that it only remained for the members to thank the Committee for the attention they were ready to bestow on the matter, and the Honorary Secretary for the trouble he had taken over it, and resolve that the minute appointing the Committee be discharged. He begged to move to that effect.

Mr. J. YOUNG (Etruria) seconded the motion. He said that, as there was no report of the Committee before the meeting, there could hardly be much discussion on the results Mr. Hack was good enough to give them. It seemed unfortunate, if Mr. Elliott felt able to put the matter right, that he had not arranged for a visit of the Committee.

Mr. J. F. BELL (Stafford) said they could not pass from the paper without expressing their best thanks to Mr. Hack for the exhaustive manner in which he had described his experiments. It would have been more pleasant to him to have been able to show that the process was a commercial success; but he could not do so. He (Mr. Bell) had been to Ludlow three times, and had seen Mr. Elliott's system; and it occurred to him that the results obtained there and at Swan Village might be accounted for in some measure by the heats being very much greater at Ludlow than they were when he visited Mr. Hack's works. He did not know what was the weight of charge in Mr. Elliott's retorts; but probably it was lower than in Mr. Hack's case. The fact remained that the results were, as far as he could learn, very much better at Ludlow than at Swan Village. He thought this might be partly accounted for by obstructions and stoppages. The heat being so low, the coal was not pushed along so fast.

Mr. R. O. PATERSON (Cheltenham), who had just entered the room, said he was sorry the discussion of the paper had been delayed, because, owing to the lapse of time, the subject had naturally very much passed from their recollection. It occurred to him that, when Mr. Hack gave the members the particulars of his experiments, they were all considerably struck by the comparatively poor results he obtained, especially as compared with the figures he presented in his table recording the results of tests with the same coal, with which he had been experimenting, by the ordinary method of working. He (Mr. Paterson) would like to ask if the latter experiments had been made with the same retorts, and at the same heat, as those carried out with the Elliott process; because what struck him forcibly was this: Bad though a process might be, there was no reason why, if they put a definite amount of coal into a retort at a certain temperature, they should not get from that coal a given quantity of gas, which should, in some measure, approximate to that obtained in the ordinary method of gas manufacture. But Mr. Hack in no way approached the results of ordinary working; so that the members might be disposed to conclude, if they did not know that the trials were conducted by a gentleman of whose ability and *bona fides* they had not the faintest suspicion, that there was something radically wrong in the whole experiment. He knew that, in some parts of the paper, Mr. Hack accounted, as he thought, for a number of points of leakage by which losses of gas might have occurred during the trials; but he admitted that, having done all he could to explain the bad results, he was utterly unable to account for the whole of the loss of gas he had demonstrated in the experiments. He (Mr. Paterson) did not know that Mr. Hack had since been able to do so. He (the speaker) had no great opinion of Mr. Elliott's system being an improvement upon the ordinary method

* See JOURNAL, Vol. LVIII., p. 755.

of working. He believed certain results might be obtained; and they had his statement that he made 10,000 cubic feet of gas per ton of coal by this process. If that was so, then there must be some explanation wanting for the results realized at Swan Village, which in no way approximated to those obtained from coal in ordinary working. If these bad results were due to the system *per se*, then it was condemned. Of this, there could be no doubt. He was speaking in the presence of Mr. Hack, and did not throw any reflection upon him in regard to the experiments, but simply referred to the system. If the whole defect arose, as Mr. Hack seemed inclined to believe, from the impossibility of propelling the coal and coke forward in the retort, then, of course, it was a great reflection upon the system. But he himself saw it working at Ludlow; and he must confess that there was no difficulty in propelling the carbonized coal and coke forward to prepare for the succeeding charge of coal. On this point he did not see why the system should fail, because, if they pushed the same plastic coal forward with the plunger, they would crush that mass of plastic material, and heap it up in the retort. But, having done this, and prepared for the next charge, that mass became carbonized, and would be rigid and cohesive enough to stand the next charge; and so they made progress to the end of the retort. Therefore he did not see any reason for the failure of the system on this ground. If, on the other hand, it arose from the multiplication of causes to which Mr. Hack alluded—to the leakage of gas from the valves and sliding plates, and through the charging tube, and so on—there might be, and he could conceive that there was, a good deal to be said against the system. But when the very worst was attributed to that, he did not think it could account for the bad results obtained by Mr. Hack. In the first experiments, from the 14th to the 18th of October, the production of gas per ton of coal was 9666 cubic feet, or thereabouts. This approached the ordinary retort working. The coke amounted to 12·91 cwt., which was approximate to the usual figures, although it would be high for Derbyshire coal. But if they took the three experiments from the 23rd of October to the 6th of November, the make of gas was only 7688 cubic feet per ton of coal; while the coke was increased from 12·91 cwt. to 13·57 cwt. per ton. Assuming that the same coal was used, it was impossible to account for this excess of coke from any other cause than the lack of heat in the retorts. He should have liked Mr. Hack to explain the figures; because, taking the table as it was, he should, on that ground alone, unhesitatingly condemn the conclusions arrived at from these trials.

Mr. J. Annan (Wolverhampton) expressed regret that Mr. Paterson was not present at the commencement of the meeting, as, after what was then said, he would not, he thought, have taken up the paper in the manner he had done.

Mr. Paterson: Excuse me, I was discussing the system as it is detailed in the paper. I know nothing of the other circumstances mentioned.

Mr. Meiklejohn remarked that, although the lowering of the temperature would in some measure account for the reduction in the quantity of gas, he should like to ask how it was that the tar did not increase, which he should think would also be a result of low temperature. He was sorry that anything should take place in the Association which would damp the ardour of any member in the work he wished to put forward. On the contrary, it would have given him great pleasure—and he was sure it would have afforded equal pleasure to Mr. Hack—had the trial proved a perfect success, and had the Association been able to put on record that the successful inventor was one of their own members. But he hoped Mr. Elliott would not be cast down, or relax his efforts in securing ultimate success, for all knew "how far high failure overtops the bounds of low successes;" and Mr. Elliott might do well to remember this, admitting, as Adelaide Proctor sings—

> "Glorious it is to wear the crown
> Of a deserved and pure success;
> He who knows how to fail, has won
> A crown whose lustre is not less."

The President said he should like to ask Mr. Hack if he considered placing the fire at the charging end of the setting was right, and if it would not cause the heaping up of the half-carbonized coal in the retort. If such were the case, it had occurred to him that this might, in a measure, account for the apparatus not being able to push forward the coal as Mr. Elliott had done at his works. He believed that at Ludlow the fire was at the opposite end of the retort.

Mr. Hack said he could not but express regret at the delay which had occurred since he had the honour of reading his paper; also that the Committee had not had an opportunity of making an independent investigation of the subject. He should have been exceedingly pleased had this been afforded, because, without doubt, it would have done away with any feeling existing among the members that the results of the trials might, and as some said must, be something more than he had been able to record. He had to thank Mr. Bell for his remarks. He might say that one of the reasons for trying the experiments was to carry out, in a measure, the idea he had, that it was better for one Corporation to undertake the investigation of the facts, than to repeat the experiments at a number of works. This was why he agreed to the suggestion to make the experiments at Swan Village. With regard to the question raised as to the temperature of the retorts, he might say that it was uniform throughout, and, so far as he could judge from the inspection of the works at Ludlow, fully equal to that at which Mr. Elliott was carbonizing. He did not attribute the blockages and stoppages to the general temperature of the retorts, but he did attribute the obstructions to insufficient temperature at jast the point where the coal was distributed in the mouthpiece. This was one of the reasons why, in answer to the President's question, he put the furnace at the charging end of the retort—that he expected to get a higher temperature than he would have at the opposite end, where the coke cylinders were. Mr. Paterson had asked if the experiments were made in similar settings, and under like conditions, to those carried out in the ordinary way. To this he (Mr. Hack) replied that they were not made under the same conditions, but in the same retort-bench. They were not conducted in the ordinary retorts, because these were horizontal, and Mr. Elliott's were at an angle of about 29°. But, with the exception of the angle, the retort-bench, the exhauster, and all the other appliances, were the same as existed at the time the experiments were made with coal in the ordinary way. With reference to the remark of Mr. Paterson, with respect to the figures given in the table, and his views as to the unsatisfactory results which he (Mr. Hack) had unfortunately had to record—that those results must be due to want of heat—he thought that gentleman must have overlooked the particulars furnished in the remarks. It would be seen that, when the yield of gas was 9666 cubic feet per ton of coal, the retorts were blocked 10 times; whereas, when it was 8393 cubic feet, they were blocked no less than 105 times. He thought the table should be taken as not simply recording the yield of coke and gas, and so on. To explain it, they must look to what happened during the progress of the experiments; and this was the answer, and the only legitimate answer, that could be given—the same coal, the same apparatus, and the same system being used.

Mr. Paterson asked how it was that there was more coke one time than another. This was the difficulty he was in.

Mr. Hack said that in his experience he had always found the weight of coke the same from the same coal; but, if there was any gas left in the coke, the latter did not weigh the same as if it were all out. There was one thing he had to mention with regard to the yield of 10,000 cubic feet of gas per ton of coal. Though Mr. Elliott had not been able to afford the Committee an opportunity of investigating the patented system at Ludlow, he (Mr. Hack) knew, as a matter of fact, that Mr. Elliott had not been getting this quantity of gas, or anything like it, from the coal. It was this fact, and other circumstances, that made him regret all the more that an independent inquiry was not made in respect of this process. He agreed that all praise was due to Mr. Elliott for his efforts to bring in a new, or improve the old, system of carbonizing coal; and he (Mr. Hack) very much regretted that the results he had been able to put before the Association had not been successful. It had been said before that, by accepting the paper, they were risking Mr. Elliott's reputation. He did not think this was so at all. He thought if anyone had an invention he considered would be beneficial to the gas profession, he would naturally like the results of any experiments which had been made to be placed before the members. They wanted to know whether or not they were successful, and whether it was desirable for their purpose to make further experiments regarding them. Seeing what were the results he had obtained, he should have hesitated in presenting them, had not the members who met at Swan Village pressed him to do so. He very much regretted that they had not been successful; and, with regard to the whole process, he did not think there was any other explanation to be given than that which he had stated in his paper.

Mr. Bell proposed a vote of thanks to Mr. Hack. He said it was not pleasant to record a failure; but he thought Mr. Hack had acted in a fair and impartial manner. When he (Mr. Bell) first saw the process at Ludlow, he was very much struck with it; but, after hearing Mr. Hack's paper, and thinking it over, he came to the conclusion that the principle was wrong. He did not see how they could get over the fact that, commercially, it was a failure.

Mr. Paterson, in seconding the proposition, said he thought it was due to Mr. Hack that he should do so. He had the misfortune to occupy the chair at the meeting at which Mr. Hack read the paper; and he made the suggestion that, without giving Mr. Elliott an opportunity of showing his process, they were hardly in a position to discuss the paper. He believed Mr. Hack would accept from him his assurance that, in making that suggestion, it was not meant as any reflection upon him. It was made on the broad ground that, as an Association, they should ventilate the subject to the best of their power. Mr. Elliott did not give them an opportunity of inspecting the process at his own works; and therefore the matter dropped, so far as they were concerned.

The proposition was cordially adopted.

Mr. Hack acknowledged the vote, and said it thoroughly repaid him for his trouble in carrying out the experiments and preparing the paper. He fully accepted Mr. Paterson's statement that he had no other desire than to have the matter fully elucidated; but he himself felt they were not risking Mr. Elliott's reputation in what was proposed, because the paper was presented with Mr. Elliott's knowledge, and *carte blanche* was allowed him to do the best he could with the apparatus.

Instructions were given that whatever he required should be done, and every effort made to render the experiments successful. He could only repeat that he regretted they were not a success; but, as his figures showed, it was an impracticable process to carry on.

MR. JONES'S PAPER ON "STOPPED ASCENSION-PIPES: THEIR CAUSES AND CURE."*

Mr. ANNAN asked if the drums did not become warped with the heat.

Mr. JONES replied that they did not; they retained their form. In reply to another question, he said the only deposit he found was a little free carbon on the front. He had had the holes in the later ones he used made larger than in those he first employed. Under no circumstances had he had a stopped ascension-pipe since he had adopted them. The coal he carbonized was North Staffordshire.

Mr. HACK said he was sure the members were all very thankful to anyone who would bring something forward to do away with the frightful evil of stopped pipes. As to Eveson's patent compound, which was to be an "infallible cure," it was of no use whatever. With regard to the length of the hydraulic main, he had himself experienced the trouble of the pipes getting out of level owing to the contraction of the retort-bench. He had overcome this, however, by reducing the main; but the best way was to observe the difference of level owing to the heat, and take note of it when re-setting the retorts. They kept the mains level by allowing for the effect of temperature before they started. Some time ago a process was patented for putting a plate in the mouthpiece, just beyond the ascension-pipe; a space of two or three inches being allowed from the retort to the plate. The effect was to cause the current of gas to dip, and pass under the plate, before it went into the pipe, thus keeping the gas cool; and they found it was pretty nearly a cure for stoppages. The men, however, knocked the plates about a great deal; and the expense of repairing the damage was so great as to cause them to discontinue their use.

Mr. J. S. REEVES (Bilston) said that he should like to ask Mr. Jones what useful purpose was served by having so many holes on the side of the drum. It seemed to him that a good many of them would be of very little use. He had not seen the apparatus before; but it forcibly reminded him of the fact that, at one of the meetings of the British Association of Gas Managers, a grid was introduced, and the bars of the louvre were so placed as to throw the gas downwards, and they could put them in such a position as to intercept the gas on its way to the ascension-pipe. The same results would be obtained by this as by Mr. Jones's method; and, in appearance, the louvre bars had the advantage of simplicity. The effect of the gas striking on the grids was that there was a great deposit of carbon, which could be removed by a brush. He was not himself much troubled with stopped pipes; but where they had a good many, it might justify the adoption of the system.

Mr. HUNT said there was no doubt that whatever tended to lower the temperature of the gas when it entered the ascension-pipe would reduce the difficulty arising from stoppages, Some years ago, he applied a water-jacket to the pipes with this object; and in nine cases out of ten, it effected a cure. There was nothing original in it, as it was applied about twenty years ago; but, for some reason or other, it had lost its charm. He had been puzzling himself with Mr. Jones's figures; and he did not see how his appliance could reduce the temperature of the gas, because at the mouthpiece it was about the same. It was only at the second hole that there was a very appreciable falling off. It would have been very useful if Mr. Jones had carried the experiment further, and inserted a thermometer in the bottom of the mouthpiece; because he assumed that, if the arrangement really lowered the temperature of the gas in the ascension-pipe, it was brought down before the gas entered the pipe, owing to the gas impinging upon the interior surface of the mouthpiece. Mr. Reeves had mentioned that the plan before them reminded him of the arrangement devised by Mr. Vincent, and introduced to the British Association of Gas Managers in 1874 by a namesake of Mr. Jones—viz., a grid to be put into the retort; so that evidently there was something in the idea. What they wanted to find out was in what manner it really operated. If it acted as a cooler, how was the effect produced? If Mr. Jones could throw any light on this point, he (Mr. Hunt) would be very pleased.

Mr. J. S. CRANMER (Stratford-on-Avon) said he once adopted baffle-plates—using about five. He found that they prevented stoppages in the ascension-pipes; but he had a serious increase in the accumulation of carbon. He should therefore like to ask Mr. Jones if he had experienced similar results.

Mr. BELL said he was one of those who had been troubled with blocked pipes; and he found a cure in taking the tar out of the hydraulic main. He worked with high heats, and was not now troubled with stoppages. With regard to a remark which had been made that those who worked light seals were troubled with obstructed pipes, he himself found the contrary to be the case. His experience was that, where stopped pipes were met with, it was by the hydraulic main getting full of tarry matter. Like Mr. Hunt, he was rather at a loss to understand all the effects produced by Mr. Jones's drums—how they would increase the make of gas or reduce the tar.

Mr. ANNAN said he should like to ask Mr. Jones if his mouthpieces were longer than usual; because he failed to see how, if the drum were employed in the mouthpiece of the retort, and especially if it were placed further in, it could escape being very quickly burnt out. He supposed Mr. Jones had not yet begun to work generators, or he would have found that, when he brought up the heat to the proper degree, it would twist his drums in all directions. In works where there were only a few stokers, and these not fully employed, they might be troubled with the drums; but if they were taken into large works, where would they find stokers to attend to them? If Mr. Jones could make something that would last, there might be some use in it.

Mr. J. A. HARRIS (Wigston) said he claimed to work with high heats; and his average production of gas was 11,160 cubic feet per ton of coal. He had not a single stopped pipe all last winter. He changed the coal, and then he was troubled with them at once. He believed there must be something in that.

Mr. J. C. BELTON (Wellington) said he should like to ask Mr. Jones what was the size of his ascension-pipes, and whether or not they were straight. About six years ago, when he succeeded to the management of the Wellington Gas-Works, the ascension-pipes were tapered. They were 5 inches in diameter at the bottom, and 4 inches at the top. He then had a large number of stoppages. He had taken away the tapered pipes, and put in their place pipes which were 6 inches in diameter from the mouth to the top; and he had scarcely had an obstruction since. It appeared to him that the stoppages had not so much to do with the coal employed as was supposed. When using Yorkshire coal, they had as many stopped pipes as with North Wales coal. He attributed the freedom from trouble to the alteration in the size of the pipes.

Mr. S. H. MILLARD (Hinckley) said one point which struck him was the almost phenomenal reduction of temperature with the use of the drums. He should be inclined to say that it was not a lowering of the temperature of the gas, but simply that the globules of tar were not allowed to go forward, and get on the thermometer used for taking the temperature. If the solid matters were carried forward and collected on the thermometer, they would record a rise of temperature. He questioned if the temperature of the gas itself was reduced, as Mr. Jones had stated.

Mr. T. CROSS (Cannock) said he understood Mr. Jones to say that the drum was 1 inch smaller than the retort; and he wished to know if there was not room for the gas to get away by passing over it. How did the gas get through the holes in the drum, if it had room to pass round it?

Mr. W. R. COOPER (Banbury) said Mr. Jones had alluded to the variation of dip. What dip did he work with, he asked, and how could he explain the fuel account being reduced, and the quantity of gas increased?

Mr. JONES, in reply, said Mr. Bell had inquired if there was any variation in the coal to account for the better results he had obtained. To this he could answer that, during the whole of the time he was dealing with this question and making the necessary experiments, there was no change in the coal contracts. Mr. Young had asked whether there was any alteration in the settings which could be put down as one of the causes of the improvement in the make of gas. He was afraid that he had not stated anything to this effect in the paper; but he could assure the members that there was no change in the settings, and therefore they could have nothing whatever to do with the improvement in the make. Still he thought it a fair inquiry, seeing that he had not mentioned the fact. With regard to Mr. Reeves's question as to why holes were placed in the sides of the drum, the reasons were obvious. They were, first, to lighten the weight of the drum; and, secondly, to ensure better working. For instance, if the face of the drum should become partially obstructed with solid particles of carbon, the holes in the side would act as a relief to the proper passage of the gas. Mr. Hunt had inquired how he (Mr. Jones) accounted for the great reduction in the heat of the lid, cross-bars, and surroundings, when the retort was so hot, and being so near the mouthpiece too. Seeing that the drum acted as a hollow partition, and the front disc received all the first heat from the retort, naturally this left less heat for the middle and back discs of the drum to stand—in fact, the back disc never exceeded a dark red heat. Therefore, as the lid and cross-bar, &c., were still farther away, in his opinion this accounted for the great reduction in the heat of which he had spoken. The temperature of the cross-bar was so much reduced that anyone could, by putting his hands upon the different fittings of the lid, tell by the temperature which retort contained the drum. Mr. Cranmer wished to know whether there was not an increased deposit of carbon in the retorts. To this he must again affirm that, during the time of his experiments, he did not notice any increase. Besides, by the action of the drum, the pipes were constantly kept open; and therefore they allowed free egress for the gas as it was made, so that there was certainly less opportunity for the carbon to form. He was told that stopped pipes arose through working with high heats and light seals; but he worked with high heats and light seals, and yet had no stopped pipes. Mr. Bell's experience was not similar to his own; and he should still adhere to the opinion he had expressed—viz., that high heats and

* This paper was given in the JOURNAL last week (p. 771).

uneven seals were the *main* cause of stopped pipes. Mr. Annan asked the length of his mouthpieces, and the heats he worked at; and he also expressed the opinion that the drums were too frail to stand the rough usage of the retort-house. The mouthpieces he employed were comparatively short ones; being only 14 inches long, and this he was of opinion was much too short. With reference to the heats, without wishing to appear vain, he should like the members to examine his coke-hearth; and this would show, better perhaps than anything else, the sort of heats there had been. As to the lightness of the drum, he might say that he had several which had been been in use for the last six months; and he found that, by coating them with lime-wash, they were protected from the heat, and lasted much longer. Mr. Belton had put a question as to the length and the size of the ascension-pipes. They were 5 inches in diameter and 10 ft. 6 in. long. Mr. Millard wanted to know whether he (Mr. Jones) noticed any difference in the globules of tar deposited on the leg of the pyrometer at the different stages of the experiments. To this he must certainly admit that he had failed to notice it, as his attention was more particularly drawn to the other end of the pyrometer. With reference to an inquiry by Mr. Cross, in theory it made no material difference as to the drum fitting tight, but in practice it needed to be narrowed; as, though the gas did escape round the sides, the largest portion passed through the front disc, and was thus split up into streams in its rush to the ascension-pipe. If not reduced, the drum would wedge when heated. In answer to Mr. Cooper, as a rule, they worked with a 1-inch seal; but during the whole of the summer months, with 3-10ths only. Allowing ½-inch pressure for exhausting through one of Kirkham, Hulett, and Chandler's washers, this would make in all 8-10ths. Owing, however, to small mains, &c., he had to increase this to 1½ inches in the engine-house during the winter months.

The PRESIDENT: When you tested without the drum, did you notice whether there was a large deposit of tar?

Mr. JONES: Yes.

The PRESIDENT: And was there much deposit with the drum in?

Mr. JONES: I cannot say there was any difference whatever. In reply to Mr. Cooper, I may remark that during the whole summer my seals were less than an inch. The gauge in the engine-house indicated 3-10ths to 4-10ths. I have a 1-inch dip in the main.

Mr. BELTON said he should like to know how Mr. Jones could account for his increased heats when he claimed a 25 per cent. reduction of fuel.

Mr. JONES said it might be accounted for from the fact that though it was considered necessary, in putting up single beds of retorts, to protect them with thick walls at the back, yet there was nothing but a quarter or three-eight inch plate at the mouthpiece; and this was where the heat ran away. The retort was white hot up to the flange; but this was not the case in the retort adjoining it. There was no smoke.

Mr. MEIKLEJOHN proposed, and Mr. HARRIS seconded a hearty vote of thanks to Mr. Jones for his paper.

The motion was carried, and briefly acknowledged by Mr. Jones.

Death of Mr. W. Sutherland.—We regret to record the death of Mr. W. Sutherland, who for a period of about 22 years filled the position of Secretary and Collector of the Shanklin (I.W.) Gas Company. Deceased, who was in his 75th year, had been a resident at Shanklin, where he had originally kept a school, for the greater part of his life.

Southern District Association of Gas Engineers and Managers.—The last meeting of the members of this Association for the present year will take place next Thursday, at the Holborn Restaurant, under the presidency of Mr. Andrew Dougall, of Tunbridge Wells. The business will consist of the election of the President and Officers for 1893; the admission of new members; and the reading of a paper on "Purification," by Mr. C. C. Carpenter, of Vauxhall.

A Tar Products Company.—Under the title of the Tar Products Sales Committee, Limited, a Company has been registered with a capital of £75,000, in £1 shares (subject to increase or reduction), to carry on business as dealers in tar, tar products, and the residuals obtained in the manufacture thereof, and any other businesses which may seem to be capable of being associated therewith. Among the first subscribers to the Articles of Association are the following: Mr. S. Bagster Boulton, Mr. J. S. Boulton, Mr. J. Forbes, and Mr. G. Abbott.

Retirement of Sir J. N. Douglass.—Many of our readers will learn with regret that Sir James N. Douglass is about to relinquish, on account of ill-health, his position of Engineer-in-Chief to the Trinity House. Apart from the services he has rendered to navigation by the construction of some of the principal light-houses, Sir James has done good work in connection with their illumination, as testified by the high-power gas and oil burners which bear his name. The retirement will take place at Christmas next. Although his successor has not yet been officially appointed, we believe Mr. T. Matthews, a member of the engineering staff, has been selected by the Elder Brethren, who have also nominated Mr. W. Douglass (a son of Sir James) as their Consulting Engineer.

REGISTER OF PATENTS.

Automatic Gas-Meters.—Beechey, C. G., of Liverpool. No. 16,459; Sept. 29, 1891.

This invention has reference to a gas-meter, so constructed that it will be freed by the act of placing a coin or the like in it, so as to allow it to pass a given quantity of gas; and which, after such a volume of gas has passed through it, automatically becomes stopped or locked, and no more gas can be passed until another coin is placed in the apparatus. The main object is to provide "apparatus of the above class which shall be simpler, and more efficient and certain in their operation, than those hitherto proposed, and which also shall be more suited to requirements, and to the nature of the conditions concerning the supply of gas in small and prepaid quantities."

Fig. 1.

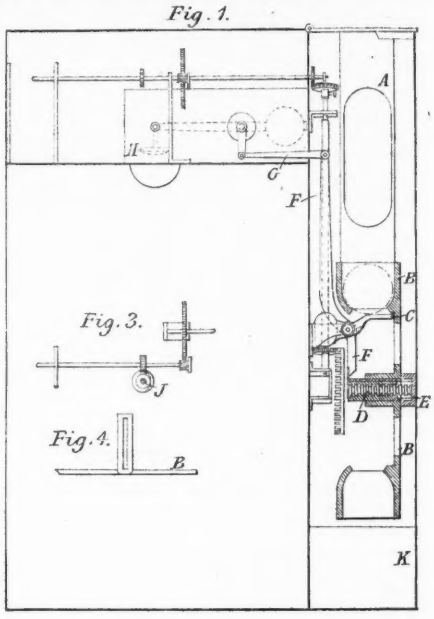
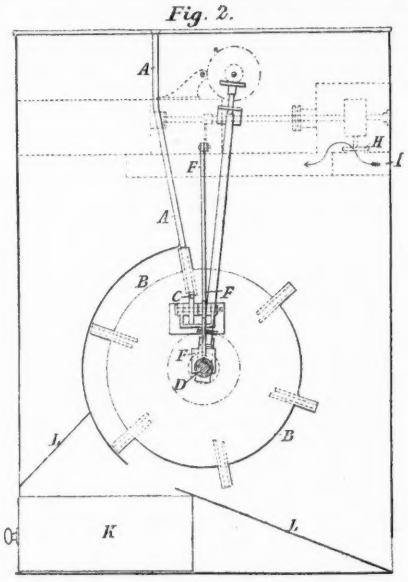


Fig. 2.



Figs. 1, 2, and 3 show this invention applied to a dry meter—fig. 1 being a sectional elevation; fig. 2, a section; and fig. 3 a plan of the driving gear. Fig. 4 is a plan of one of the pockets of the mechanism actuating wheel.

A is the tube or conduit adapted to receive and convey the pennies to the mechanism; a slot being provided in the top of the meter, through which the coin is inserted. B is the wheel with pockets on its periphery, adapted to receive the coins, and by which the weight of such coins is adapted and serves to "set" the meter. C is a hinged detent, having a counterbalance, by which the wheel B is held and released. D is a worm or threaded shaft, worked from the meter as hereafter described; the ends of the worm being mounted and fixed in the meter as shown. E is a sleeve with a female thread, working on the worm D, and having a key which works in a corresponding keyway in the boss of the wheel B. F is a lever fulcrummed to a bracket, and the lower end of which is bifurcated, and abuts against one end of the sleeve E; while the other is connected to the gas-controlling valve through the rod G, with its crank shaft and lever. H is the gas-inlet valve. There is a tight case in which the lever and valve H work; the inlet and outlet of gas (from the ordinary gas-inlet I) being effected by the diaphragm in I. There is a crown wheel fixed on the worm-shaft D, worked from the existing crank-shaft J of an ordinary dry

meter through worm-wheels (fixed respectively on the crank-shaft J and the ordinary counter mechanism shaft), spur-wheels, &c.

The operation of the apparatus is as follows: Prior to the insertion of a coin (say, a penny) in the slot, the detent C will have its active end above the point shown in fig. 1, and engaged with and holding the wheel B by the corner piece of metal, which is provided in connection with each of the pockets of the wheel. When, however, a coin X falls from the conduit into one of the pockets (which are always coincident with, or directly under, the conduit when the payment is not being made), its lower edge strikes and rests upon the free end of the lever C, and depresses it, and disengages it from the wheel. In this condition —assuming two preceding pockets of the wheel to be charged with pennies—the weight of the coins in the periphery of the wheel cause it to make a partial revolution. By this means, the sleeve E will be revolved to a similar extent, and will be thereby moved longitudinally on the worm-shaft D by the thread thereon; and will thus, through the lever F and intermediate connection, have opened the gas-valve H. After the pocket charged with a penny leaves the catch or detent C, the latter is lifted, by its counterbalance weight, into such a position that, when the next pocket comes up to it, the wheel B will be stopped and cannot move until the insertion of another coin. When the pockets have passed the shield, they fall out by gravity into the drawer K in the bottom of the meter.

By this construction, it is provided that the apparatus would be capable of receiving a number of coins one after the other, each of which will move the sleeve E a certain distance of the extent of its stroke, and thereby open the gas-valve a greater distance. When the limit of longitudinal motion or stroke of the sleeve is reached, no more coins inserted in the meter will effect its operation.

A meter having been "set" as described—that is, its gas-valve opened by the insertion of one or more coins—gas may be passed through the meter and burned. Directly consumption takes place, and the meter begins to move, the shaft or spindle J commences to operate (that is, rotate) the worm-shaft D, through the gear interposed between J and D, and to wind back longitudinally by rotation the sleeve E; the rotation itself in this action being prevented by the key sliding in the keyway in the boss. When this longitudinal movement reaches the point from which the sleeve started from the first insertion of the coin, the valve H will have become closed, and no more gas can pass. The meter thus stops; and the exact amount of gas for which prepayment has been made by the coins inserted, will have passed through the meter.

It will be thus seen that the mechanism is an automatic supply and cut-off, whereby, on the one hand, by the insertion and weight of a coin, the supply mechanism is free to act and operates and "sets" the meter to give an equivalent supply of the gas to the coin; and, on the other hand, by the consumption of the gas so paid for, this mechanism is worked back by the meter as the gas is consumed, and brings it back to the point from which it started, thereby shutting off the gas and stopping the meter. In order to avoid introducing into the mechanism coins of a smaller size than those by which the meter is arranged and adapted to be worked, in the inclined conduit A an aperture is provided, through which such smaller coins would fall directly into the bottom of the meter on to an inclined shelf L, down which they would slide and be returned to the user through the aperture at the bottom of the incline.

Fig. 5.

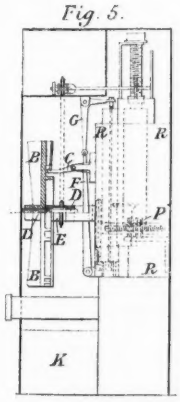
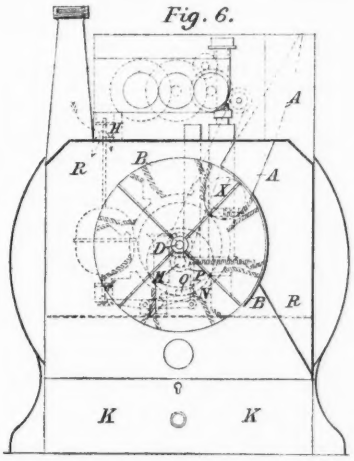


Fig. 6.



The application of the invention to wet meters is illustrated in figs. 5 and 6. Here the wheel B is mounted directly on the screwed worm or spindle D; and the sleeve E in fig. 1 is dispensed with. Its equivalent, however, is provided in the form of a sleeve outside the wheel B, and on which the sprocket wheel for working it in cutting off the gas is provided. The worm-shaft is provided with a key or feather, whilst the wheel or sleeve is furnished with a keyway in which the key or feather works. The action in this case is that, as the wheel B is rotated by the weight of the coin, the worm-spindle D receives longitudinal movement (the boss being provided with an internal thread gearing with that of D); while, by the consumption of gas, the sleeve is rotated through the sprocket wheels and chain, and the screwed worm is thereby rotated through the key, and screws through the boss of the wheel B backwards. The screw-worm D itself is supported by a bracket fixed to the existing permanent case R of the meter; and the bearing surfaces of the bracket being plain, the worm shaft or spindle D can slide to-and-fro in them. The sleeve E is driven by the sprocket gear just specified—a shaft, worm-wheel, and worm; this latter being formed on the lower part of the existing spindle of the unit wheel of an ordinary wet meter. The coin-wheel B in this case has its pockets arranged in the same plane as the wheel; and the coin-conduit A has a twist in it of 90°. The freeing detent lever C is arranged as in the dry meter. It holds the wheel B, and is itself disengaged by the coin coming in contact with it and resting on it, when dropped in.

When gas is consumed, after the "setting" of the meter by the action of the coin-actuated wheel B, the screwed worm D comes in contact with the lever F, and presses it back. This action, through the bell-crank lever G, closes the ordinary float-actuated existing valve H of the meter, by pulling down the spindle of it and the float. To set the meter to give a supply of gas, of course the reverse action takes place; and through the levers and parts just specified, the valve H is allowed to lift, and so become "set" to allow gas to pass.

In some cases—to cause gas to shut off slowly, so that a warning is given to the users—the ordinary existing spindle which carries the drum of the meter, is provided with a disc N, in connection with which is adapted to work a brake O, fixed on the fulcrum spindle. The action of this is that, when the amount of gas for which prepayment was made has been consumed, the brake is lifted simultaneously with the movement of the lever, when the valve H is being closed, and presses the disc N, and causes the meter to move slowly and eventually stop—the gradual diminution of light giving warning to the consumer. P is the ordinary existing worm on the spindle M; and the worm-wheel is driven thereby. The brake mechanism just described may be used in some cases (where desired) alone, as a means of stopping the supply of gas when the quantity paid for is consumed.

With respect to the means by which different quantities of gas may be supplied for the same value of coin, a wheel is mounted detachably on a shaft or spindle, and provided at its end with a thread, on to which a thumb nut is screwed, and by which the wheel is held on. When it is desired to change the quantity to be supplied for a given coin, a different sized wheel is substituted for the one on—a larger wheel will give less gas, and a smaller one more gas, for a given coin.

Gas-Engines.—Robinson, H., of Manchester. No. 20,745; Nov. 28, 1891.

This invention relates to "improvements in engines, in which the piston is propelled by the ignition and expansion of a mixture of gas, or combustible vapour and air, or other supporter of combustion." The cylinder of the engine is cooled by water contained in the foundation of the engine, which acts as the tank, and which thus is made in such a manner that the water will circulate about the cylinder without assistance, in the following manner: The cylinder is bolted upon the tank to a suitably planed surface; and the surface is formed at such an angle that the cylinder is considerably below the centre of the crank-shaft, so that it is oblique and close to the ground at its end farthest from the crank-shaft. The cylinder is formed with a water space or jacket round it; and this space is in free communication with the tank or bed of the engine. The jacket at the front end of the cylinder is extended forward, so that the front end becomes horizontal, and allows the water in the jacket as it becomes heated to circulate into the tank or bed, and cool water from below to take its place (and this without water-pipes, or other connections). Beyond the crank-shaft, or at the end of the tank furthest from the cylinder, the tank may be heightened, and a suitable opening formed through which the tank may be filled. The warmer water finds its way into this highest part or prolongation of the tank or bed, and the cooler water goes along the lower part of the tank to the cylinder jacket.

To actuate the valves of the engine, the exhaust-valve is operated by a cam or eccentric upon the engine-shaft; a rod from the eccentric or cam actuating a wheel with various sizes of teeth, which throw the rod into and out of position for actuating the exhaust, as described in patents No. 14,787 of 1890, and No. 1083 of 1891. The speed of the engine is governed by a catch, or detent, or tongue-piece, pivoted on the exhaust-valve stem in such a manner that, when the exhaust is opened, the tongue-piece comes against a stop, which moves it into such a position that it would come in contact with another stop during the early part of the action that would otherwise close the exhaust. A spring or gravity (or their equivalent) tends to move the tongue-piece into such a position that it will miss the last-named stop when the engine is running at or below its normal speed; thus allowing the exhaust to close. Should the engine run above its normal speed, the tongue piece has not time to get into position to miss the stop, and the exhaust is not allowed to close as described in the 1891 patent; and, in addition to this governing device, an adjustable stop may be arranged to restrict the motions of the tongue-piece.

Working of Gas-Engines.—Wilkinson, J., of Ingleton, Yorks. No. 524; Jan. 11, 1892.

This improvement relates to the working of the old style of gas-engines—such as the Bischoff and other similar makes, which are defective, says the patentee, in not making constant and regular revolutions, which cause serious inconvenience. He proposes to remedy this by causing ordinary coal gas as now used to pass through a vapour of benzoline, gasoline, or any other similar volatile oil or liquid, contained in a cylinder filled with cotton, prior to being delivered into the bag which supplies the engine for explosive purposes. The mixture of gases passes from the bag to the engine at various parts according to the engine's construction; and the result is that it "improves the combustive properties of the ordinary gas, much more readily igniting, thereby providing a regular and constant motion of the engine." He also claims to apply his invention to the lighting of the front part of the engine. Hitherto, engines have been lighted both at the back and front; but this improvement can be adapted to both parts.

Gas-Generators.—Boult, A. J.; communicated from H. C. Rew, o Chicago, U.S.A. No. 7379; April 19, 1892.

The object of this invention is to provide apparatus for coking bituminous coal, and for using the coke in the manufacture of gas, "with as little labour as practicable, and without unnecessary consumption of coal or loss of heat."

Fig. 1 [next page] is a plan of the apparatus; fig. 2 is a section on the line 2 of fig. 1; fig. 3 is a section on the line 3 of fig. 2; and fig. 4 is a section on the line 4 of fig. 2.

Fig. 1.

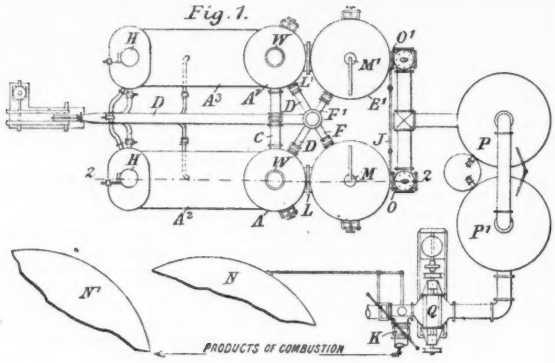


Fig. 2.

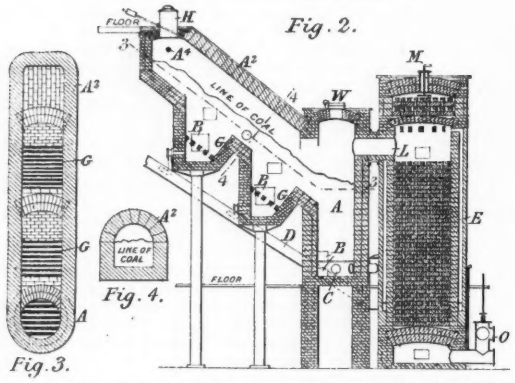


Fig. 4.

Fig. 3.

A A^1 are combustion chambers, connected at the base by the flue C, in which coke is raised to incandescence by admitting air through the pipe D, and used for decomposing steam. They are fitted at their tops with manholes and vents W, having gas-tight covers; at their base, they are supplied with doors B for removing ashes. A^2 A^3 are coking chambers above the combustion chambers, and directly connected thereto, in order that the coke may fall by gravity from the coking chambers into the combustion chambers. The open space above the coal serves as a conduit for vapours and gases. Separate combustion chambers G are provided in the base of the coking chambers, having separate air-supply pipes and ash-outlets B.

Openings with suitable covers are provided in the sides of the coking chambers, through which bars may be inserted to break up the mass of coking coal, and to move it down the incline into the combustion chambers. The coking chambers are preferably fitted at the top with a suitable tight-feeding apparatus H, in order that coal may be supplied without the escape of heat and gas, and without fully opening the chambers.

The regenerators E E^1 are directly connected with the combustion chambers by open flues L L^1. They are filled with loosely piled refractory material, and serve the purpose of storing and retaining the heat of the burning gases made while heating up, and which is subsequently used for the superheating of the steam and the fixing of the gases generated. Gas burning chambers in the regenerators, having pipes F F^1, and flues and ports for supplying heated air to burn the primary products of combustion, are connected with flues L L^1. Above these chambers, perforated arches and a separate chamber filled with loosely piled refractory material are constructed, to be utilized for vaporizing the oils supplied through pipes M M^1, which vapours are used in enriching the gas. At the base of the regenerators, outlet-pipes O O^1, controlled by valves for the escape of the products of combustion and gas, are provided—connecting directly with the condenser and water-heater P and the washer P^1, exhauster Q, and holder N for the gas, and the holder N^1 for the final burned products of combustion. A valved outlet for these latter is also provided into the open air, if desired. The outlet mains from the exhauster are controlled by valves K. These are connected by a lever or equivalent mechanism; so that, when one outlet-valve is opened, the other is simultaneously closed—thus providing an outlet for the escape of the final burned products of combustion and gas from the exhauster. A small pipe connected with the main from the exhauster discharges a continuous stream of gas, which is alternately non-combustible while heating up and combustible while making gas. To test the character of the gas, and to determine when to change the outlet-valves, a burner supplied with gas from the holder furnishes a continuous test flame.

The operation of the apparatus is preferably as follows: The fuel chambers A, A^1 A^2 A^3 G, are first filled with coke or hard coal through the tight-feeding apparatus H; and the openings at the top are then tightly closed. The fuel is ignited in the base of the chambers A A^1 and in the receptacles G, for incandescent fuel in the coking chambers. Air is supplied preferably from a fan-blower through pipes and air-ports, to raise the fuel to incandescence. At the same time, the exhauster Q is put in operation; the valves in the outlet-pipes being open. The primary products of combustion pass through flues L L^1 into the regenerators E E^1. Heated air to burn the gases is supplied through pipes F F^1; and the final burned products of combustion pass down through the regenerators E E^1 through outlet-pipes O O^1, the condenser P, the washer P^1, and the exhauster Q, and are then discharged into the open air. This operation raises to incandescence the fuel in the steam-decomposing chambers A A^1, and in the combustion chambers G G located in the bases of the coking chambers.

The heat generated by burning the primary products of combustion is stored in the generators. When the apparatus is properly heated, the air-supply pipes are closed; and steam is simultaneously admitted to the base of one of the regenerators, by opening the valve in the pipe J, which is connected with the outlet-pipe O. The valve in the outlet-pipe is then closed, which directs the steam upwards through the regenerator E and the flue L (highly heated), into and down through the incandescent fuel in the chamber A, in which it is partially decomposed. The resulting water gas and undecomposed steam then pass through the flue C into and up through the incandescent fuel in the chamber A^1; and the resulting water gas (the steam being thus completely decomposed) passes into the heated regenerator E^1. At the same time, the valve in the pipe connecting the tops of the coking chambers A^2 A^3 is opened, to permit the passage of the coal gas generated in the coking chamber A^2 into the chamber A^3, and thence into the regenerator E^1 without passing through the incandescent fuel.

A mixture of water gas and volatile hydrocarbons distilled from soft coal are thus mingled and passed into the regenerator E^1, and are converted into a fixed illuminating gas—consisting of carbonic oxide and light carburetted hydrogen by passing down through the heated refractory material. The gas is drawn from the base of the chamber E^1 through the pipe O^1, the condenser P, the washer P^1, and the exhauster Q; and it then passes away for storeage or use. The valve K, controlling the outlet-pipe for the final burned products, is then closed; and the valve to the gasholder N is simultaneously opened, by operating the lever connected with both valves—thus directing the combustible gas into its proper holder. When the heat in the apparatus has been reduced, by the superheating and decomposition of the steam and by the fixing of the gases, the steam is shut off; and the air is again admitted to the combustion and coking chambers for heating up, and the valve in the outlet-pipe O is opened. When the non-combustible gases generated while heating up pass the exhauster, the gas burning at the outlet test-pipe is immediately extinguished; and the valves are again changed so as to close the valve to the gasholder, and direct the final products into the open air, as in the beginning. It is thus seen that the operations of heating up and of making gas are alternate; the exhauster being kept steadily in operation. A holder N^1 is shown, into which the final burned products of combustion may be directed, if required.

In case it is desired to increase the candle power of the combustible gas, oil is admitted to the upper chamber in the regenerator E^1 through the pipe M^1 while making such gas; and while it is flowing down through the loose brickwork and heated arch through the perforations, it is vaporized, and is then mingled with the volume of water gas and coal gas generated in the combustion and coking chambers, and all are combined into a fixed homogeneous gas by passing down through the heated brickwork. As the steam-inlets and gas-outlets to the regenerators E E^1 are similar, the operation of gas making can be reversed at will, according to the condition of the fuel and the regenerative chambers. For instance, after heating up the apparatus, steam may be admitted to the base of the regenerator E^1; and the resulting gases generated in the combustion and cooking chambers, may be enriched and fixed by passing through the regenerator E.

Portable Gas-Generating Apparatus.—Goldsmith, J. M., of Chicago, U.S.A. No. 10,806; June 7, 1892.

The object of this invention is "to make gas-generating works, which will be portable and operative automatically, to generate gas for fuel or illuminating purposes from crude petroleum or other oils containing gas, and supplying the same to the place of use, together with various improvements in the parts and details of construction of such works." The invention consists in a large number of minor "features and details of construction," described in 14 pages of printed specification and 12 sheets of drawings, without which the subject-matter of the patent could not be fairly appreciated.

APPLICATIONS FOR LETTERS PATENT.

18,934.—Clark, W., "Obtaining motive power from coal, coke, and other carbonaceous substances." Oct. 22.

18,970.—Duthuit, E., "Heating-stove burning gas, petroleum, or other liquid fuel." Oct. 22.

18,990.—Armour, L. H., "Manufacture of illuminating gas." Oct. 22.

19,024.—Potter, W. G., "Spreaders and Argand burners and chimneys for gas and oil." Oct. 24.

19,172.—Orling, A., "Electrical apparatus for lighting and extinguishing gas-lamps, and for indicating automatically whether the gas is lit or extinguished." Oct. 25.

19,204.—Johnson, J., "Air and gas meters." A communication from F. E. Youngs. Oct. 26.

19,228.—Hyslop, J. M., "Gas-regulator." Oct. 26.

19,270.—Goerldt, G., "Gas-lighting apparatus." Oct. 27.

19,320.—Eichler, J. G. H., "Liquid measuring apparatus or fluid-meter." Oct. 27.

19,337.—The Lamp Manufacturing Company, Limited, and Collins, I. J., "Overhead regenerative gas-lamps." Oct. 27.

19,464.—Cloudsley, J. L., "Gas-governors." Oct. 29.

19,482.—Lake, H. H., "Burner for cooking-stoves and soldering apparatus." A communication from B. A. Hjorth and Co. Oct. 29.

19,483.—Wells, A. W., "Carburetting gas and air for illuminating and heating purposes." A communication from F. Verruc. Oct. 29.

The Mexborough Local Board and the Water-Works.—At a meeting of the Mexborough Local Board last Thursday, the question of the water supply of the district was brought forward; and a discussion took place as to the purchase of the works of the Company. It had been known for some time that the latter were willing to negotiate with the Board for the transfer of the concern; and a letter was read from the Company offering to sell the works to the town for £10,300. Some of the members expressed the opinion that £10,000 would be accepted, and that this should be offered. Others remarked that the Company were asking £1000 more than the works were worth. Eventually it was decided, by a majority of one vote, not to accept the offer.

CORRESPONDENCE.

[*We are not responsible for opinions expressed by correspondents.*]

Anthracene.

SIR,—I should not reply to the letter of your correspondent who signs himself "A Silly Tar Distiller," but that it may convey a wrong impression. In the first place, so far as I know, no one either desires or expects the Chartered Company to "speculate in anthracene dealings." But, as the owners of the largest tar distilling business, they are expected to conduct it on business principles—such as, in fact, they would be compelled to adopt if they were simply tar distillers only, and had not the gas consumers to fall back upon.

Your correspondent says: "We are at the mercy of Germany and the Germans," whose "factories in this line," he is informed, "pay from 25 to 40 per cent." This appears to be owing to the persistent refusal of the Chartered Company to act in concert with the few leading English tar distillers. It is these gentlemen, more than the gas companies, who are complaining of the low price of anthracene, and who would, if it were higher, give a higher price for tar. Consequently, so far at least, your correspondent is mistaken in saying their interests are not the same as those of gas companies.

Further, if at any time there should be over-production of tar or tar products, the Chartered Company could, and should, take its part, and a leading part, with others in burning tar, and not act as they did a few years ago, when tar went down to ½d. per gallon—when, to reduce the output, gas companies all over the kingdom burnt a large proportion of their make while the Chartered Company burnt little or none. This surely would not be speculating.

Your correspondent is also mistaken in saying the South Metropolitan Company are "quite as much tar distillers as The Gaslight," because "they sell on a sliding scale." They sell at "per gallon," and have no sliding-scale arrangement whatever. But, if it were so, that would not make them tar distillers. It would simply make their interests run more perfectly with those of the tar distillers.

The simple fact is that the Germans get at least £400,000 a year which we ought to keep in this country; and I think gas companies and tar distillers have a right to expect the Chartered Company to help to retain it, more especially if what everyone says is right—that it is by their action that the Germans have been enabled to get the better of the British tar distillers.

GEORGE LIVESEY.

Nov. 5, 1892.

Stopped Ascension-Pipes.

SIR,—I have read with interest Mr. T. B. Jones's paper on the above subject—one with which, in my experience, I have had a good deal to do, though at present I am in the happy condition of hardly knowing what a stopped ascension-pipe means. My heats are by no means low (if I have any difficulty, it is to keep them down); and I am making 11,000 cubic feet of gas per ton of coals. This does not agree with the remarks Mr. Jones ventured to make.

It is about twenty years since I saw a screen put into the mouth of the retorts to keep back the particles of carbon, &c. This screen was of various forms—one form like a Venetian blind; another a half-moon—all of which devices were only partially successful.

There can be no doubt that the kind of coal used has a great deal (if not all) to do with stopped ascension-pipes. In Scotland, where chiefly cannel coal is used, we—compared to English managers—know little about stopped pipes. Where only caking or coking coal is used, the fuel is, of course, better; and consequently the heats are higher. Six-hour charges are common; and I have found the pipes stop frequently about the fifth hour, when little gas was making, and the heat was higher.

From what I have observed during the past seven years, when only about seven cases of stopped pipes have come under my notice, it seems to me that the best cure for the evil is to have ascension-pipes of a large size, and tapered—say 4 inches at the hydraulic main to 6 inches at the mouthpiece. Then keep the hydraulic main cool, either by having a stream of liquor running through it, or having it placed well up from the top of the settings, so as to allow air to circulate around it. I think this is the secret of my freedom from stopped ascension-pipes. My hydraulic main is in sections—only eight pipes in each section—and placed 3 feet above the top of the bench. Any case of stoppage I have had has been at the mouthpiece, and have attributed it to carelessness of the men not using the gouge before charging.

In the third paragraph of Mr. Jones's paper, he names seven or eight cures for the evil. Most of them I have tried at various times, often to no purpose. I have seen a large gas-works almost at a standstill with stopped ascension-pipes; and, on looking back on the trouble, I cannot help thinking it was owing to a structural defect of the bench and fittings—pipes too small and not tapered; hydraulic main too hot; very high heats; small coal; and six-hour charges. A retort-house in such a state is not a haven of rest; and the stokers' lot is a most unhappy one.

I have no doubt many will bear me out in most of the above points. Gas is made in the same way all the world over; and why some works should be subject to stopped ascension-pipes, and others entirely free, should be a question having a definite answer.

THOS. D. HALL.

Montrose, Nov. 4, 1892.

Regenerative v. Ordinary Settings.

SIR,—Mr. Irving, in his letter published in your issue of the 1st inst., assumes that my previous communication on this subject was written for the purpose of congratulating Mr. Latchford on his results, as an implicit believer in the same. Congratulations are neither mentioned nor inferred in any part of my letter. I did suggest that if Mr. Latchford *could* "explain how it was done," he would earn the gratitude of his professional brethren.

Now, I am free to admit that I fell into the error of putting a wrong interpretation on the figures, and concluded that it was another way of stating the fuel account to be 10·26 lbs. of coke per 100 lbs. of coal carbonized. I think it is generally accepted that this is the correct way of stating it. However, I am not disposed to quarrel with "the fates" that led me into this mistake, as it may perhaps be conceded that, by discarding as impossible the theory of the percentage of fuel given being based on the coke made, I may have some slight claim to be classed with the "practical readers."

Results such as I inferred are attainable with regenerative furnaces; but I used the word "exceptional" in their connection with ordinary settings. More than this I was not justified in saying, till further information was forthcoming. We are now in possession of Mr. Latchford's explanation of how he calculates his percentage, and of Mr. Irving's comments thereon. Is Mr. Irving quite sure that the coal in question will yield 48 bushels per ton of coal carbonized? and, if so, will he tell us how he arrives at this result? A difference of 25 per cent. in the yield of coke requires some explanation.

H. L.

Nov. 5, 1892.

Testing Crude Coal Gas.

SIR,—Your correspondent "Zeno" is quite correct in pointing out that 35·67 grains of lead acetate per pint of distilled water is the correct quantity for the Wanklyn solution. But I find 35·7 grains per pint near enough for our ordinary work; and this, I believe, is the proportion sent out by Griffins and like firms. I am much obliged to your correspondent for pointing out what is evidently a mistake in copying for the printer, as the error had escaped my notice, and might have passed uncorrected.

THE WRITER OF THE ARTICLE.

Nov. 5, 1892.

Sales of Shares.—A number of shares in various local gas undertakings were sold by Messrs. Howgate and Chapman, at Wakefield, last Friday week. Fifty fully-paid £1 shares in the *East Ardsley Gas Company* realized £1 9s. 6d. each; 30 £10 shares in the *Pocklington New Gas Company* produced £3 each; £250 of "A" stock, in separate sums of £10, in the *Ackworth, Featherstone, Purston, and Sharlston Gas Company*, fetched £11; five original £10 shares in the *Rothwell Gas Company* were disposed of at £20 each; ten £10 additional shares in the same concern changed hands at £14 15s. apiece; £85 of general capital stock in the *Normanton Gas Company* realized £146; and seven £5 "B" fifth shares in the *Wakefield Gas Company* sold at £10 7s. 6d.——At Newark, last Wednesday, 17 new ordinary shares in the *Newark Gas Company*, earning 7 per cent. dividend, were sold at £16 and £16 2s. 6d. each. Two £10 shares in the *Collingham Gas Company*, paying 6 per cent., and up till recently 10 per cent., were sold for £14 5s. per share, and two shares of £2 each found a buyer at £2 17s. 6d. each.—— The proposal of the Chatham Corporation to purchase the local waterworks, instead of depreciating the shares of the *Brompton, Chatham, and Gillingham Water Company*, is having quite the contrary effect; and during the past week 18 £5 shares changed hands at an average price of about £15 each. Nineteen £5 shares in the *Rainham (Kent) Water Company* have lately been sold at an average of £10 10s. each.——Last Tuesday, 1000 £10 shares in the *Airdrie and Coatbridge Water Company* were offered for public sale in the Burgh Court Hall, Airdrie, Mr. Alex. Morrison, Airdrie, being the auctioneer. They were put up in lots of 20 at the upset price of £11; the dividend being 5 per cent. per annum, and to rank *pari passu* with the Company's present ordinary £5 shares, the dividend on which is limited to 10 per cent. The shares realized from £13 2s. to £13 14s. each.——At Montrose, last Friday, a share in the *Montrose Gas Company* was sold for £59. The original amount of the share was £10; but they have been since doubled in value. The dividend has for some time been at the rate of £3 per share.

Southampton Gas Company.—The half-yearly meeting of this Company was held last Wednesday. The report submitted by the Directors stated that the profit and loss account showed the amount available for dividend was £12,346; and they recommended the payment of maximum dividends, amounting to £7494 (less income-tax), leaving a balance of £4852 to be carried forward. During the half year there was an increase in the sale of gas, as compared with the June half of 1891, of 4,500,000 cubic feet. As the Directors were confident that in the future there would be a still greater consumption of gas, both in the town and in the outlying districts, they had considered it absolutely necessary to make provision for the increased demand. They had, therefore, concluded contracts for the erection of additional works; and the buildings were already in a forward state. In moving the adoption of the report, the Chairman (Mr. R. C. Hankinson) said he thought the shareholders might consider the report to be on the whole a satisfactory and encouraging one; showing as it did increased progress on the part of the Company. He thought it right, however, to tell them, and the accounts proved it, that during the half year under review, they had really not earned sufficient to pay the dividends. Still, the shareholders need not attach too much importance to this; for at the close of the previous six months, they carried forward a considerable sum—more than was necessary to compensate for the deficiency. They had not had to draw upon the reserve fund at all, as many London and provincial companies had had to do, besides increasing the price of gas in addition. The deficiency was, of course, caused by the increased cost of coal, which had exceeded the corresponding half of 1891 by £2800; and £400 of this the Directors attributed to the strike disturbances in the North. They had had, however, to take only £1500 from the undivided profits. He believed he mentioned at the preceding meeting that the Board had made a very good contract for three years for coal, of which they were now beginning to receive the benefit; and no doubt the position of the Company next half year would be such that the earnings would be sufficient to meet the dividends. He was not at all afraid of the electric light. The fact that they had increased the sale of gas by 4,500,000 cubic feet during the half year proved that it had not injured them; and it appeared to him it was only one illuminant added to those already in use, and that there was plenty of room for all. Dr. Sampson, in seconding the motion, said the report was one on which they might congratulate themselves very considerably. He found from the JOURNAL OF GAS LIGHTING that of 106 of the largest gas companies in England, 33 per cent. had been compelled to advance the price of gas during the last two years, and to draw upon their reserve fund: well. The report was adopted.

LEGAL INTELLIGENCE.

SUPREME COURT OF JUDICATURE—COURT OF APPEAL.

Friday, Nov. 4.

(*Before Lords Justices* LINDLEY, LOPES, *and* A. L. SMITH.)

Gadd and Mason v. Mayor, &c., of Manchester.

To-day judgment was delivered in this important case, which came before their Lordships on an appeal from a decision of Mr. Justice Kekewich. The proceedings in the Lower Court were reported in the last volume of the JOURNAL (pp. 628, 668, 853, 1017); and the arguments on the appeal were summarized in the numbers for Aug. 9 and 16 last. At their close, judgment was reserved till after the Long Vacation.

Lord Justice LINDLEY: This is an appeal by the plaintiffs from a judgment of Mr. Justice Kekewich, dismissing their action with costs. The plaintiffs are patentees of an invention for improvements in the construction of gasholders. The defendants have admittedly erected a gasholder constructed according to the plaintiffs' patent. There is no doubt about the infringement; but the validity of the plaintiffs' patent is contested on the following grounds: (1) Want of subject-matter; (2) want of novelty; (3) disconformity between the provisional and complete specifications; and (4) anticipation by Terrace. Mr. Justice Kekewich decided the case against the plaintiffs on the third ground; holding that the invention described in the complete specification, and claimed in this action, was different from any invention described in the provisional specification. The invention claimed in this action is that shown in fig. 16 of the complete specification; and the learned Judge has decided that this particular invention is not covered by the provisional specification. The correctness of this view turns upon what the plaintiffs' invention really was, and upon the mode in which they described its nature when they obtained provisional protection for it. In order to ascertain the real nature of the invention, it is essential to be acquainted with the state of knowledge when the provisional specification was filed—*i.e.*, the 12th of December, 1888. The complete specification was filed on the 2nd of August, 1889. The object of the plaintiffs' invention was not new. It was to keep gasholders vertical without having recourse to the external guide-framing generally used—*i.e.*, posts with or without pulleys on their tops. In 1887, the plaintiffs had themselves taken out a patent with this object; but they then sought to attain it in a mode different from any of those adopted by them in 1888. They had recourse to a spirally inclined plane; and they obtained a patent for this invention. A gasholder may be described as a large inverted bell; it is a circular cylinder closed at the top, open at the bottom, and rising and falling in a well slightly larger than itself. As gas is poured into the holder, it rises until its bottom nearly reaches the top of the well. When rising, its equilibrium becomes more and more unstable; and, when fully risen, its instability is very great. It is, therefore, obviously essential to have some contrivance for preventing the gasholder from tilting over or jamming as it rises and falls, and from turning over when fully risen; and several expedients for this purpose had been devised before 1889. The common method was to erect a framework outside and round the gasholder, and make it slide up and down in this framework. The leading idea common to all these methods was to support the sides of the holder, and so keep it vertical. The plaintiffs' invention was different; and their leading idea was different. They dispensed with the external framework and lateral support, and sought to keep the bottom—*i.e.*, the lower edge—of the holder always horizontal by preventing any part of the bottom from rising or falling without the whole bottom doing the same. It is obvious that, if the bottom is always horizontal, the holder itself will always be vertical, and there will be no tilting or jamming. Some methods of keeping the bottom always horizontal are described in the provisional specification. Racks, and cog-wheels and wheels geared together by chains, in which the wheels worked, are there referred to as the means to be employed to effect the desired object. In fig. 16 in the complete specification, another method is shown. Racks and cog-wheels are dispensed with; and an arrangement of chains fastened at both ends, but passing over ordinary fixed pulleys, is substituted. This is the arrangement used by the defendants, and in question in this action. I will not stop to read the provisional and complete specifications; I will treat those as read in this part of my judgment. In the provisional specification, the plaintiffs described only racks and pinions, and cog-wheels geared together by chains. Fig. 16 in the complete specification shows a different arrangement altogether. Whether the pulleys are there geared together in the sense in which the toothed wheels are geared together according to the provisional specification was greatly debated in the argument before us. My own view of the matter is that, as all the pulleys in each of the sets shown in fig. 16 are acted upon by the same chain, and are so connected by it with each other that they must all move together, they are geared together in one sense at least of that expression. But the pulleys in one set cannot, I think, be properly said to be geared with the pulleys in any other set, although all the sets must work together, by reason of their being on the same gasholder. However this may be, it is plain that whereas, in the toothed wheel or torsional arrangements, each toothed wheel set in motion by a movement in a gasholder causes motion in something else, the pulleys in the tensional arrangement shown in fig. 16 are mere friction pulleys, and are no more causes of motion than so many fixed pegs would be. The difference in this respect is obvious. On the other hand, both arrangements are mechanical arrangements intended to produce, and producing, the same effect. They so transmit and distribute any lateral pressure on one part of the gasholder as to prevent any one part from being moved without the whole being moved to the same extent. The various arrangements described by the plaintiffs all answer the purpose. Moreover, no one (unless it be Terrace, whose alleged anticipation will be considered hereafter) had ever applied any such arrangements to gasholders. But hydraulic engineers had had somewhat similar difficulties to surmount in dealing with floating docks and pontoons; and they had overcome these difficulties by employing arrangements similar to some of those described by the plaintiffs. With regard to gasholders, the nearest approach to the plaintiffs' invention was Malam's patent in the year 1823, and the gasholder at Grantham. But in these the gearing was a central point at the top. The external frames were regarded as essential; and the arrangement could not be applied to telescopic gasholders. Although the idea of distributing pressure was at the bottom of these inventions, they cannot properly in my opinion, be regarded as anticipations of the invention of the plaintiffs. As regards the floating docks and pontoons, the approach to the plaintiffs' invention is much nearer. Wild's patent, obtained in 1850, and Standfield's, obtained in 1883, disclose inventions and arrangements which, in my opinion, are undistinguishable in principle from those described by the plaintiffs in their complete specification. Wild's rack-and-pinion arrangement applied to the top and bottom of his pontoon is very like that adopted by the plaintiffs; and Standfield's arrangement of chains and pulleys, shown in fig. 21 of his specification, is, so far as it goes, exactly like that shown in fig. 16 in the drawings annexed to the plaintiffs' complete specification. There is no proof that Wild's and Standfield's patents have been practically used; but there is evidence to show that they will answer their purpose. This state of facts gives rise to the first of the four questions raised by the appeal—viz., the question whether the plaintiffs' invention is one for which any patent could be granted in 1888. The plaintiffs have used, for keeping gasholders upright, principles previously described by Wild and Standfield for keeping floating docks and pontoons horizontal. Under these circumstances, can the plaintiffs' patent be supported? The present Patent Act, 1883 (46 and 47 Vic., cap. 57), has not enlarged the subject-matter of a patent. The Act uses the term "invention;" but, in section 46, "invention" is defined to be "any manner of new manufacture the subject of letters patent and grant of privilege within section 6 of the statute of monopolies." This throws us back on the old authorities on the question what inventions are included in the expression "any manner of manufacture" in the statute of James I., cap. 3. The decisions on this point are innumerable; but for the purposes of this case the most instructive are *Brook v. Aston* (8 Ellis and Blackburn, p. 478, affirmed 5 *Jurist*, N.S., p. 1025), *Harwood v. Great Northern Railway Company* (11 H.L. Cases, 654), and *Morgan v. Windover* (7 Patent Reports, 131), in which patents were held bad; and *Penn v. Bibby* (2 Ch., 127), *Carrington v. Nuttall* (L.R., 5; H.L., 205), *Otto v. Linford* (46 *Law Times*, N.S., 35), and *Hayward v. Hamilton* (Griffith's Patent Cases, 115), in which they were held good. These cases, and many others which might be cited, establish the following propositions applicable to the present case—viz., (1) A patent for the mere use of a known contrivance without any additional ingenuity in overcoming fresh difficulties is bad, and cannot be supported. If the new use involves no ingenuity, but is in manner and purpose analogous to the old use, although not quite the same, there is no invention—no manner of new manufacture within the meaning of the statute of James. (2) On the other hand, a patent for a new use of a known contrivance is good, and can be supported, if the new use involves practical difficulties which the patentee has been the first to see and overcome by some ingenuity of his own. An improved thing produced by a new and ingenious application of a known contrivance to an old thing, is a matter of new manufacture within the meaning of the statute. Under which of these rules any particular case falls depends on its own special circumstances, and is often a question of very great difficulty, giving rise to considerable difference of opinion, as in the well-known bustle case, *American Braided Wire Company v. Thompson* (6 Patent Reports, 518). But the rules themselves are intelligible enough. Their application involves a correct estimate of the degree of ingenuity which amounts to invention. The difficulty of saying where invention sufficient to support a patent exists, and where it does not, is well known to all persons conversant with patent law. This Court had occasion to grapple with the difficulty in the recent case of *Lane Fox v. Kensington Electric Light Company;* and I cannot myself throw further light upon the subject than is to be obtained from the decision in that case. If, practically speaking, there are no difficulties to be overcome in adapting an old contrivance to a new purpose, there can be no ingenuity in overcoming them—there will be no invention; and the first rule will apply. The same rule will, I apprehend, also apply to cases in which the mode of overcoming the so-called difficulties is so obvious to everyone of ordinary intelligence and acquaintance with the subject-matter of the patent, as to present no difficulty to any such person. Such cases present no real difficulty to people conversant with the matter in hand, and admit of no sufficient ingenuity to support a patent. If in these two classes of cases patents could be supported, they would be intollerable nuisances, and would seriously impede all improvements in the practical application of common knowledge. They would be mischievous to the State (to use the expression in the statute of James). But unless an invention can be brought within one or other of the above classes, a patent for it cannot be held bad on the ground of want of subject-matter. In *Minter v. Wells* (1, Webster's Patent Cases, 134), the patentee had done no more than apply an adjustable lever to the back and seat of a chair. But his patent was upheld, as the result was new and useful. The books are full of similar cases. *Hamilton v. Hayward* (Griffith's Patent Cases, 115) is one of the last. That was a patent for pavement lights, in which all that was done was to use one well-known form of prism instead of another. But the result was a new and improved pavement light. In the particular case now before the Court, I have come to the conclusion, upon the evidence, that in adapting to gasholders the methods described in Wild's and Standfield's patents for floating docks and pontoons, there were practical difficulties to be overcome; and that the mode of overcoming them was by no means obvious to persons of ordinary skill and intelligence acquainted with gasholders. I have arrived at this conclusion mainly from the facts that, although Wild's and Standfield's patents had been in existence for some years, they had nothing to do with gasholders, and even so skilled a gas engineer as Mr. Livesey had never seen how to make a gasholder rise and fall as desired without an external framework. He believed that the desired object could not possibly be attained. It was strongly urged that, if any competent engineer had been shown Wild's or Standfield's specification, and had been asked to apply the arrangements there described to gasholders, he would have had no difficulty in doing so.

This may be true; but the fact, even if proved, would not in my opinion invalidate the plaintiffs' patent. It would if the adaptation required no exercise of inventive powers. But in this case I am satisfied that, if any skilled person could have adapted Standfield's or Wild's arrangements to gasholders as suggested in argument, he would have done a great deal more than simply follow their directions. He would not be doing what they told him; but while availing himself of their suggestions, he would, in fact, have made a new and important experiment of his own. The conception of the idea of applying such arrangements to gasholders is no doubt the principal merit of the plaintiffs' invention. But if there is also, as I think there is, considerable ingenuity in carrying out the idea, and in overcoming difficulties in applying the ideas to such unstable and unwieldy bodies as gasholders, the case is brought within the second rule, and does not fall within the first. The plaintiffs have made a new and useful thing—viz., an improved gasholder; and, however obvious their invention may now seem, it was not at all obvious until they hit upon it. In *Penn v. Bibby* (L. R., 2 Ch., 127), which, in principle, comes very near this case, Lord Chelmsford laid great stress upon the fact that the new application of the old invention lay so much out of the track of its former use as not naturally to suggest itself to a person turning his mind to the subject, and to require some application of original thought and study, and some invention also. Such is the case here, with this difference in favour of the plaintiffs—that there is no evidence that Wild's or Standfield's patent was ever used. Again, I cannot assent to the argument that plaintiffs' patent is an infringement of those of Wild and Standfield. They have nothing whatever to do with gasholders. Their titles, as well as the specifications, show this. Wild's patent relates to docks, lock-gates, dock-walls, &c.; Standfield's patent relates to hydraulic lifts, floating docks, pontoons, &c. In each case the "&c." only includes things like those enumerated—some or one of them. In neither case can the "&c." in the title, or the "other structures" in the specification, be properly held to point at or include such a totally different thing as a gasholder. For the reasons I have given, I am of opinion that there was in this case a patentable invention, or, in other words, sufficient subject-matter to support the plaintiffs' patent. For the same reasons, I am of opinion that, apart from Terrace's alleged anticipation, plaintiffs' invention was novel. The leading cases on want of novelty by reason of prior publication in specifications are *Hill v. Evans* (4 De Gex and Jones, 299), *Betts v. Menzies* (10 H. L., 152), and *Neilson v. Betts* (L. R., 5; H. L., 1). These cases were examined and commented on by Sir George Jessel, the Master of the Rolls, in *Plimpton v. Malcolmson* (3 Ch. Div. 567). A specification which discloses a principle, and applies it to one thing, will not necessarily invalidate a subsequent patent for the application of the same principle to another thing. It may or may not do so; and the question in each case must be decided on the same principles as those applicable to the question of subject-matter. In considering subject-matter, novelty is assumed; and the question is whether, assuming the invention to be new, it is one for which a patent can be granted. In considering novelty, the invention is assumed to be one for which a patent can be granted if new; and the question is whether, on that assumption, it is new. Has it been disclosed before? If there is an earlier specification for the very same thing, the second invention is not new; but if the two things are different, the nature and extent of the difference have to be considered. The question then becomes one of degree. But unless it can be said that the differences are practically immaterial, that there is no ingenuity in the second invention, no experiment necessary to show whether or not it can be usefully carried out, the second cannot be said to have been anticipated by the first. This is the result of the decisions, as I understand them. Applying this test to the present case, I cannot regard Wild's and Standfield's specifications as anticipations of the plaintiffs' patent. Their inventions involved more than either Wild or Standfield has described. They showed the principle; but their attention was not turned to gasholders; and they did not show how to apply the principle to them. I am convinced that this was by no means so easy and obvious, as the defendants contend. The case is, I think, near the line both as regards subject-matter and novelty, but not so near the line as *Hayward v. Hamilton;* and on both those points the plaintiffs, in my judgment, are entitled to succeed. I pass next to the objection that the complete specification goes so much farther than the provisional specification as to describe a different invention from the one described in that document. In the present case, there has been no amendment of the complete specification. No question, therefore, arises (as in Lane-Fox's case) as to whether the original invention, as particularly described in the complete specification, has been departed from. A patentee is tied down by his complete specification to the invention particularly described and claimed. But he is not tied down to the same extent by his provisional specification, the object of which is very different. In deciding whether a complete specification goes beyond the limits allowed by law, two questions only have to be considered—viz., (1.) What is the nature of the invention for which the patentee had obtained provisional protection? (2.) Is what is described in the complete specification an invention of a different nature from the former? Here again the case of the present plaintiffs is near the line; but I have come to the conclusion that the plaintiffs have not overstepped the limits within which the law requires a patentee to keep. This part of the case turns entirely on the view taken of the nature of the plaintiffs' invention. My view is that they sought and obtained protection for an invention for keeping the bottoms of gasholders horizontal without the use of any external framework, but (instead thereof) by mechanical means, such as are described in the provisional specification. But the plaintiffs were not tied to those particular means. A patentee is not prevented from improving the means of carrying out the invention for which he obtains provisional protection. On the other hand, he must not, under colour of an improvement, obtain the advantages of provisional protection for an invention the nature of which he has not described in his provisional specification (see *Bailey v. Robertson*, 3 Appeal Cases, 1055, and *Vickers v. Seddell*, 15 Appeal Cases, 496). The whole object of provisional protection is to enable a patentee to work at and improve his invention without risk of invalidating his patent by premature publication or user (see 46 and 47 Vic., section 57,14). The only limit set to what he can do in this respect is that the invention as finally specified must not be a different invention from that provisionally protected. Now to hold, in the present case, that the arrangement shown in fig. 16 in the plaintiffs' complete specification is an invention of a different nature from that described in the provisional specification is in my opinion to take too narrow a view of the plaintiffs' real invention, and to miss its essential character. Although it is quite true—as observed by Sir Horace Davey and Mr. Carpmael—that, the object of the patent being old, the patentee must be tied down to the modes of obtaining that object described and claimed by him, it is in my opinion, wrong in point of law, even in cases of this kind, to tie him down to the particular methods shown in the provisional specification. But it is only by so tying him down that his patent can be held bad for want of conformity. Even under the present law, the Court may be driven to hold a patent invalid on the ground that the invention described and claimed in a complete specification is not the same as that provisionally protected. But, having regard to the provisions made for the comparison of the two documents by an official examiner (see 46 and 47 Vic., cap. 57, section 9, and 51 and 52 Vic., cap. 50, section 4), the Court ought not to decide against the validity of a patent on the ground in question, unless the two inventions are unmistakeably different. If a case is on the border-line, the patent ought to be held good rather than bad. In *Nuttall v. Hargreaves*, this Court held the patent bad on the ground which I am discussing; but in that case the Court came to the conclusion that, at the date of the provisional specification, no useful invention had in truth been made. The Court held upon the evidence that the tap provisionally protected was neither new nor useful; and that the subsequently invented tap was an entirely new invention. That case goes farther than any other; and it is the strongest against the present plaintiffs. It is not really an authority against them, inasmuch as the facts do not lead to similar conclusions. Upon the point of want of conformity, I am unable to concur with the learned Judge from whose decision the appeal is brought. The next and last point is that the plaintiff was anticipated by Mr. James Terrace, a gas manufacturer, who had in November, 1888, hit upon the same mode of keeping gasholders vertical as that described by the plaintiffs in their provisional specification. Mr. Terrace communicated his invention to several persons—viz., to his two brothers Andrew and David (the former of whom was employed at James's works, and the latter of whom was the Manager of other gas-works), to Mr. Stewart, who was in James's own employment, to Mr. Livesey and Mr. Walker, two well-known Gas Engineers, and to a Mr. Paterson also a Gas Manager. All these communications were made in order to obtain assistance and advice, and for that purpose only. They were in fact confidential communications, and were so understood. Mr. James Terrace also consulted a Mr. Hunt, a patent agent of Glasgow, with a view of obtaining a patent for his invention. Further, Mr. James Terrace wrote to the plaintiff Gadd, who was then a stranger to him, for advice; but the real nature of Mr. James Terrace's invention was not known to Gadd until after he had applied for provisional protection and had sent his provisional specification to the patent office. When the plaintiff Gadd knew what Mr. James Terrace's invention really was, Gadd explained to him that they had both hit upon the same idea, and that he (Gadd) had already filed a provisional specification, and was consequently first in the field. It is proved—and is not, in fact, denied—that Gadd honestly himself invented what the plaintiffs patented. It is not suggested that Gadd stole Terrace's invention from him; nor did Mr. Terrace, after Gadd's explanation, proceed further to obtain a patent himself. In addition to these communications made by Mr. James Terrace himself, it appears that his brother David communicated James Terrace's invention, as a mere matter of news, to his own foreman, M'Kechnie, to a Mr. Duncan, who was a chemist in David's gas-works. and to a Mr. Smith, a draughtsman in the same works. What was said to them was mere gossip, and ought, in my opinion, to be treated as immaterial and wholly unimportant. I agree with the contention of the defendants' Counsel, that whether an invention has been published or not is a pure question of fact, and does not depend on the motives or objects of the publisher, nor upon the propriety or impropriety of his conduct. But by the publication of an invention, is meant an addition to the stock of knowledge which the public either has or can acquire by consulting some source of information open to it. The word publication has not the same meaning when used with reference to patents as it has when used with reference to libels or slanders. The learned Judge held that the facts to which I have alluded did not amount to such a publication of Terrace's invention as to invalidate the plaintiffs' patent, and did not prevent the plaintiffs from being the true and first inventors of the invention for which they obtained their patent. Upon this part of the case the learned Judge was, in my opinion, perfectly correct. The law upon the point will be found in *Humpherson v. Tyer* (4 Patent Cases, 410), and *Plimpton v. Malcolmson* (3 Chancery Division, 53, p. 556), not to mention other well-known cases. Terrace's invention was never used in public, nor indeed at all; and such knowledge of it as the persons to whom it was communicated really had, cannot be regarded as knowledge acquired by, or open to, the public in any sense whatever. The public had no access to Mr. Terrace's description of his invention. No one had access to that who was not confidentially consulted respecting it. It would be truly ridiculous to treat what David Terrace told M'Kechnie, Duncan, and Smith about James Terrace's invention as of any importance whatever. The conclusion of the whole matter is that the attack on the plaintiffs' patent has failed; and the plaintiffs are entitled to relief. With respect to the kind of relief, the case is peculiar. Defendants have erected the gasholder complained of by the plaintiffs under a contract with a Mr. Pease. He applied for a patent three days after the plaintiffs filed their provisional specification; and he got an order from the defendants, and set up a model of his invention in the summer of 1889, before the plaintiffs filed their complete specification. It was at one time suggested that the plaintiff Gadd got the idea of the tensional arrangement shown in fig. 16 of the complete specification from this model. But it was admitted before us that this suggestion was not supported by the evidence; and the imputation at one time made against

Mr. Gadd was very properly abandoned. The case is not one which calls for relief in the shape of a mandatory injunction; nor for an injunction to restrain the use by the defendants of the gasholder which they have erected. But the judgment for the defendants must be reversed; and, if the plaintiffs desire it, they are entitled to an injunction restraining the defendants from erecting any other gasholder according to the plaintiffs' patent. The plaintiffs are also entitled to damages; and to the costs of the action and of the appeal.

Lord Justice SMITH delivered judgment to the same effect. He said the persons really contesting the suit were Messrs. Ashmore, Benson, Pease, and Co., Limited, who had erected for the defendants a gasholder in accordance with a patent taken out by Mr. Pease on Sept. 13, 1889. It was admitted that, if the plaintiffs' patent was valid, the defendants had infringed it. But it was alleged that the patent was bad—first, by reason of non-conformity between the provisional and the complete specifications; secondly, by reason of anticipation by Malam's, Wild's, and Standfield's patents; thirdly, by reason of prior publication. Mr. Justice Kekewich had decided against the plaintiffs on the first ground—viz., that the tensional mode of controlling the motion of a gasholder by ropes or chains was not contained in the provisional specification. A further defence was raised in the Court below—viz., that the plaintiffs, between the date of the provisional and that of the complete specification, became aware of the system of tensional arrangement, and slipped it into their complete specification. But this defence wholly failed; and Sir H. Davey frankly stated that he no longer relied upon it. The principles on which the first point must be decided were settled by a long series of authorities, several of which he cited. The first thing to be ascertained was the nature of the invention; because, until this was done, it was impossible to say whether the complete specification contained a separate invention or only an improved method of carrying out the original one. All the mechanical means employed by the plaintiffs in this case were old; but they had brought about, by a novel application of these means, a new result of great utility, which *primâ facie* was good subject-matter of a patent. This invention enabled the guide-columns, which before 1887 stood round the sides of a gasholder, to be dispensed with; and, in lieu thereof, the lower ring or curb of the holder was kept horizontal by ropes or chains, so that the weight and pressure were equally distributed when it rose or fell by reason of the gas being supplied to, or withdrawn from it, or when it was pressed by wind from without. That this invention was of great merit could not be doubted; for Mr. Livesey, the Chairman of the South Metropolitan Gas Company, had stated that the plaintiffs had accomplished what he had thought to be impracticable. Mr. Newbigging also said that a gasholder was a very fragile structure, composed chiefly of very thin sheets; and that until Mr Gadd's beautiful invention was brought forward, it had always been thought to be impossible to guide such a vessel from the bottom. This witness was not only an engineer of very long experience, but the author of the leading text-book on gas engineering. This evidence was uncontradicted; but it was said by the defendants that the provisional specification only sought to guide and support the holder at the bottom by means of racks and cog-wheels, which had been called the "torsional" arrangement, and not by ropes or chains and anti-friction pulleys, which had been called the "tensional" arrangement, and appeared for the first time in the complete specification, and which was a new invention. He had not read the voluminous evidence which had been given on both sides as to the meaning of the words employed, because in his view the evidence of experts as to the construction of a specification was inadmissible, except as to the meaning of scientific terms when they occurred, or the working of mechanical appliances, or as to what effect such working would bring about. It was the practice of admitting this evidence which caused much of the excessive length of patent actions. [His Lordship proceeded to quote the most important passages from the provisional and complete specifications.] The question, apart from the use of the words "mechanical equivalents," turned on the meaning of the words "gearing," "gear into," and "geared together." It appeared to him that these words did not require any assistance from experts. They were words in common use—not scientific terms, or words used in any particular context. To "gear," or to "put in gear," meant to connect or couple up one part to another; and to "ungear," or to "throw out of gear," meant to disconnect or uncouple one part from another. The word "gearing" meant the tackle by which the different parts of machinery were connected or coupled together. It was a mistake to say, as the defendants did, that "gear" meant that one piece of machinery transmitted its force to another. In the case in hand, the parts geared together, whether by torsional or tensional means, had no force in themselves to transmit. The force was produced by the movement of the gasholder; and, when it was applied to any one spot, it was equally transmitted to all with which it was geared—the moving force being imparted to the gasholder by the gas from within, or by the pressure of wind from without. His reading of the provisional specification led him to the conclusion that the words therein described the tensional system which was more fully explained in the complete specification. His Lordship then referred to certain parts of the evidence on this point, some of which he thought was admissible, and some not; but it did not, he said, conflict with the conclusion he had arrived at. He did not give any opinion on the question whether or not the tensional system was indicated by the words "mechanical equivalents," and, if so, whether the claim was too large, as, in the view he took, it was not necessary to do so. He then considered the alleged anticipations. Beginning with Malam, he pointed out the difference between the two systems—noticing especially that this was not applicable to telescopic holders, and required a central gearing of shafts within the circumference of the vessel. In the same way he dealt with the alleged anticipations by Wild and Standfield; and he came to the conclusion that, in either case, invention would be required to adapt to gasholders the principle therein applied to floating pontoons or hydraulic lifts. He thought, therefore, according to the several decisions, the plaintiffs' invention was not anticipated. As regarded the prior publication by Mr. Terrace, his Lordship agreed with the Judge below, and with the judgment delivered by Lord Justice Lindley; and he also agreed with the latter as to the relief to which the plaintiffs were entitled.

Lord Justice LOPES (whose judgment was read by Lord Justice Lindley) said: I entirely concur with the judgments delivered on all points except on the point of want of subject-matter. The plaintiffs have, in their complete specification, applied to gasholders the principle to my mind undistinguishable from that applied by Wild and Standfield to things of an analogous kind—viz., to floating docks and pontoons; the object being the same, namely, to keep the things operated upon upright and their bases horizontal. Then the question arises whether the application of the same principle to another thing of an analogous kind is subject-matter of invention. The answer is in the affirmative, if there is sufficient exercise of the inventive faculty in the application or adaptation. I have difficulty in finding in this case any such exercise by the plaintiffs of the required inventive faculty. I doubt whether, if any competent person, conversant with such matters, had been shown Wild's and Standfield's patents, and been asked to apply the principle of those patents to gasholders, he would not readily, and without the exercise of any patentable ingenuity, have been able to do so. It is therefore with great hesitation that I assent to the judgments arrived at in this case on the point of subject-matter.

Mr. CLARE said he supposed the plaintiffs would be entitled to a certificate that the validity of the invention had been in question, and that the breach had been proved.

Lord Justice LINDLEY: Yes.

Mr. CLARE asked for costs on the higher scale. In the Court below Mr. Justice Kekewich had given them.

Lord Justice LINDLEY said he thought costs on the higher scale ought only to be given in cases of unusual difficulty—antiquarian research, and things of that kind. The idea of allowing costs on the higher scale in all patent actions was one that he would not sanction.

Mr. CLARE asked for an injunction with regard to the future, and an inquiry as to damages.

Their Lordships granted it.

HIGH COURT OF JUSTICE—QUEEN'S BENCH DIVISION.

Friday, Oct. 28.

(*Before Mr. Justice* VAUGHAN WILLIAMS.)

In re Smith, ex Parte Mason.

In this case, an important question was raised with regard to the position of the Official Receiver where a person, at the time the receiving order is made, is indebted in respect of his gas. The debtor, Mr. J. Smith, was the owner of the Bon Marché, at Brixton; and an order was made against him on Feb. 22 last. He was in arrear for the gas used in his business up to Christmas, 1891, in the sum of £173, due to the South Metropolitan Gas Company; and on Feb. 20 he sent a cheque for this amount. The cheque was not presented at the Bank until Feb. 24, after the order had been made; and payment was in consequence refused. The Company thereupon cut off the gas, and declined to reconnect it at the request of the Official Receiver until cash had been given for the cheque. He eventually paid the money under protest; and application was now made to the Court by the Trustee to have it repaid to him. The question turned in great measure on whether the Official Receiver could be said to be an "occupier" within the meaning of the Gas-Works Clauses Acts.

Mr. TINDAL ATKINSON, Q.C., and Mr. MUIR MACKENZIE appeared in support of the application; Mr. HERBERT REED, Q.C., and Mr. MELLOR, for the Company.

Justice VAUGHAN WILLIAMS said the Court had come to the conclusion that the Company were right in their contention, and that the Trustee was wrong. No doubt, if the matter were to come before the Legislature again, very strong arguments would be urged for acquiring some provision to enable a Receiver (under the circumstances of the Receiver in the present case) to insist upon a supply of gas without paying the arrears of the debtor against whom the order was made. But the Court had no right to strain the Act of Parliament, and to insert into it, by construction, provisions which were not there in fact. It was conceded that the Receiver was not entitled to call on the Company to supply him with gas unless he was an occupier or owner within section 11 of the Gas-Works Clauses Act, 1871. It was also conceded that there could not be two owners or occupiers of the same undivided premises at the same time. This being so, it was plain that the Official Receiver could not claim the supply of gas in that capacity, unless he could say the occupation of the debtor had determined. It was plain that the occupation of the debtor had not determined, and the same premises continued to be vested in him as before the receiving order was made. But it was further said that the contract had been put an end to. The Court did not agree with this contention. Therefore it was left that the estate remained the same and the contract the same; and from this it would seem that the occupation of the debtor remained the same. The Court did not know whether there might be a possible case, where the debtor had absconded, for example, and left the premises vacant under such circumstances that he would be no longer occupier. But there was no suggestion of such a thing in the present case; and the debtor was occupier in fact, notwithstanding the making of the receiving order, and the consequent appointment of the Official Receiver by virtue of the statute. The application of the Trustee must therefore be refused.

Oriental Gas Company, Limited.—The report of the Directors of this Company for the year ending June 30 states that the rate of exchange during this period ruled very low; the loss being £19,195, as against £11,559 in 1890-91. The revenue balance (after paying an interim dividend of 4 per cent.) is £30,319, from which the Directors recommend a dividend of 6 per cent., tax free; making 10 per cent. for the year, and leaving £12,319 to be carried forward.

New Joint-Stock Companies.—The Newent Gas Company, Limited has been registered with a capital of £5000, in £10 shares, to acquire, the undertaking of the Newent Gas Company, and to carry on the business of a gas company and as electrical engineers. The Alkali Syndicate, which has been formed with a capital of £20,000, in £5 shares, is to carry on the business of alkali manufacturers' engineers, and to acquire and work certain patents in connection therewith.

MISCELLANEOUS NEWS.

IMPERIAL CONTINENTAL GAS ASSOCIATION.

The Half-Yearly General Meeting of this Association was held on Tuesday last, at the City Terminus Hotel, Cannon Street, E.C.—Sir JULIAN GOLDSMID, Bart., M.P., in the chair.

The SECRETARY (Mr. R. S. Gardiner) read the notice calling the meeting, and subsequently the following report of the Directors:—

The present half-yearly ordinary general meeting of the proprietors has been convened in conformity with the Association's Acts of Parliament for the purpose of receiving a report from the Directors upon the affairs of the Company, and of declaring a dividend for the half year ended the 30th of June last.

The following summary shows the results of the Association's operations during that period: The quantity of gas made in the half year was 4126 million cubic feet; and the quantity made in the corresponding half year of 1891 was 4075 million cubic feet—being an increase of 51 millions, or at the rate of 1¼ per cent. The total number of lights on the 30th of June last amounted to 1,998,732; there being at that date 138,585 consumers on the books of the Association. At the close of the corresponding half year of 1891, the number of lights was 1,934,529, which gives an increase of 64,203, or at the rate of 3·32 per cent. The entire length of mains on the 30th of June last was 1629 miles; and on the 30th of June, 1891, 1568 miles—being an increase of 61.

Although the profit of the Association for the first half year of 1892 is only slightly in excess of that for the corresponding half year, the volume of business done has sensibly increased. The receipts for gas have risen; and the cost of coal shows a reduction. But the value of the chief product—coke—has declined considerably.

The plant and mains at all the stations were maintained in a due state of efficiency.

The increase of the Association's business at Vienna has necessitated considerable extensions; and additions are being made to the retort power at the principal works there. At Brussels, increased storeage capacity was provided on the Forest works by the addition of another lift to one of the gasholders. A new gasholder is also in course of erection on the works at Weissensee, near Berlin. At Hanover, by an arrangement with the Authorities, the Board has been enabled to supersede the old overhead wire-rope system of conveying coal into the works by a branch connecting the gas-works with the railway. This outlay ought in the end to result in considerable economy in working.

The Directors have sold land for which there was no further use at Aix-la-Chapelle, Rotterdam, and Toulouse.

In order to extend the use of gas for purposes other than lighting, the Directors have introduced at most of the stations the system of letting out apparatus on hire and of selling the same on payment by instalments, which they hope will result in a further increase in the day consumption.

The Association's head office in London was transferred on the 26th of May last to the new premises at 21, Austin Friars, E.C.; and the advantage of the change has already become apparent in the greater facilities afforded for satisfactorily carrying on the business of the Association.

The Directors desire in conclusion to draw the attention of the proprietors to the accounts for the half year ended the 30th of June last. These have been duly audited; and from them the Directors have, in accordance with the provisions of the Companies Clauses Consolidation Act, prepared a scheme showing the profit of the Association for the half year, and the portion thereof applicable to the purposes of dividend, which they recommend now to be declared—viz., a dividend of 5 per cent. for the half year ended the 30th of June last, and a bonus of 1 per cent., both payable free of income-tax on and after the 1st day of December next.

The CHAIRMAN, in moving the adoption of the report, said that it did not contain anything specially new; but it represented a very large amount of business carried on upon principles to which he referred at their last meeting. He told them that they were then looking forward to some reduction in the cost of coal. This had taken place, and the reduction continued; but unfortunately there had been a larger reduction in the selling price of coke at many of the foreign stations. The result was that they had not benefited so much as they might have done, or should have done, by the decrease in the price of coal. These were changes in the market which could not be influenced by any Company, however powerful; and no Board of Directors could control them in any way. All they could say was that they had observed the event; and they tried to follow it as best they could. Fortunately, on the other side, there had been a small increase in the value of ammoniacal liquor, which, on the whole, of late years had fluctuated very considerably in price. The final result of the accounts of the half year had been that there was a very small balance to the good, compared with the corresponding period of the previous year. He mentioned to them, he thought, at a previous meeting that their percentage of gas not accounted for was extraordinarily small; but small as it was on the occasion in question (he believed it was something less than 5½ per cent. in the corresponding half year) it was only a little more than 4 per cent. at the present time—a result which, he believed, scarcely any other gas company in the world could show. With regard to the gas industry generally, about a year or eighteen months ago, he mentioned that there was a strong feeling on the part of some engineers that great advantage would be reaped hereafter by the system of inclined retorts. He said on the same occasion that they meant to look into the matter, and to see for themselves how far these retorts would be of advantage. They had accordingly put up a number of them in Vienna under satisfactory conditions; and they hoped, in the course of a year, to be able to arrive at their own result, which, according to the opinion of some of their Engineers, would also be satisfactory. He was looking the other day at the JOURNAL OF GAS LIGHTING for the 18th ult., in which he saw a long list of works in England where these retorts had been adopted. He would not trouble the shareholders with the list; but he had it with him printed. An account was also given of the extremely profitable result which had followed upon their adoption at the Huddersfield Corporation Gas-Works. He merely mentioned this in order to show them that other companies were thoroughly investigating the matter; and therefore, among them all, they would doubtless arrive at a satisfactory conclusion. He did not think they could say that he had committed himself very strongly in giving them this information; but he had put them exactly where he was himself. As to the rest of their business, it had proceeded in the usual way; and he did not think that anything had occurred in the course of the half year to which the report referred which required special mention from him. He would now proceed, as he had always done at their meetings, to tell them anything of interest which had occurred since the closing of the accounts. He would first of all refer to what had been alluded to before—viz., the change from their old offices in Clement's Lane to the new ones in Austin Friars. He used to be of opinion that their old offices in Clement's Lane were the most insanitary offices in the City of London, from the number of persons who had to be there. They were all crowded one on the other; there was no suitable accommodation for anyone, considering the number of persons who had to be housed; and the result was eminently unsatisfactory for everyone concerned. Their new offices gave every advantage that could be fairly expected from any office in which a large business had to be transacted; and he desired to record the Directors' satisfaction at the way in which the architects had performed their part of the work. They had been enabled to sell the old premises upon satisfactory terms. They were now properly installed at their new offices; and they were free of, and shortly expected to be paid for, the old premises in Clement's Lane. There had been another event, but of a regrettable character—viz., that their colleague, Mr. H. M'Lauchlan Backler, had, owing to his health, found it necessary to resign his post on the Board of Directors. Mr. Backler had been connected with foreign gas companies all his life, and was a man of large experience and business capacity; and they all regretted that he had found it necessary to resign. After careful inquiry, they had filled the vacant place by electing Mr. Robert Tindall, an old shareholder, who, they trusted, would do good service to the Association. He might also tell the shareholders that, in the course of last month, two of their officers completed 50 years in the service of the Association—their Chief Engineer, Mr. Leonard Drory, at Berlin, and Mr. Anton Dudeum, who for 50 years had been Chief Accountant in Vienna. These two gentlemen, each in his respective sphere of duty, had admirably discharged what they owed to the Company; and he (the Chairman) had thought it right, even at their general meeting, to record the fact, of which the Directors had made suitable note in the course of their proceedings. There was only one other point for him to mention. They had recently extended up to 1927 their concession at Antwerp; and to a very great extent it was owing to the efforts and work of their Secretary that this matter was now satisfactorily concluded. Of course, he did not mean when he referred to this to say that they had no other negotiations. As he had often said at their meetings, they were frequently having negotiations; this feature being one of the troubles of foreign gas companies. An English gas company existed under Act of Parliament, and had merely to pursue the even tenor of its ways; whereas in their own case—except in a few isolated instances—they had to renew their concessions from time to time. This involved very hard work, both to the Directors and the officers; and the results were often unsatisfactory. They had, however, all given their work ungrudgingly, and had done their best for the Association.

Mr. NEWTON seconded the motion, which was at once unanimously carried.

The CHAIRMAN afterwards proposed the declaration of a dividend of 5 per cent. for the half year ended June 30, and a bonus of 1 per cent., on £3,800,000 stock of the Association, payable, free of income-tax, on and after Dec. 1.

Mr. BASSETT seconded the resolution, which was adopted.

On the motion of Mr. G. BARRETT, seconded by Mr. L. DAVIDSON, a vote of thanks was passed to the Chairman and Directors.

The CHAIRMAN, in reply, assured the shareholders that all the Directors took great interest in the business of the Association. He believed that the number of their shareholders had of late years been rapidly increasing; but, whereas in former years he believed 200 or 300 of them used to attend, now, with the larger number, only about 100 shareholders were usually present. He was told that this was the best mark of satisfaction with the conduct of a Board that could be offered by a numerous proprietary; and the Directors were much gratified at the shareholders' appreciation. He afterwards proposed a vote of thanks to the officers both at home and abroad.

Mr. NEWTON seconded the motion, which was unanimously adopted.

The proceedings then terminated.

GEORGETOWN (BRITISH GUIANA) GAS COMPANY, LIMITED.

The Half-Yearly Meeting of this Company was held last Tuesday, at the London Offices, 30, Gracechurch Street, E.C.—Mr. ALFRED WILLIAMS in the chair.

The SECRETARY (Mr. S. Wood, F.C.A.) read the notice convening the meeting; and it was agreed to take as read the Directors' report and the accounts, to which reference was made in the JOURNAL for the 18th ult.

The CHAIRMAN, in moving the adoption of the report and accounts, said that during the past six months they had lost a considerable number of the public lamps; the Electric Lighting Company having taken them over by order of the Council. Altogether there had been a loss of revenue on public lighting and on residual products of £853; but there had been a saving of £898 in the expenditure. This being so, he thought they might congratulate themselves that the presence of the electric light, so far at any rate, had not interfered with the payment of the usual dividend.

Mr. CHARLES GANDON seconded the motion, which was carried unanimously.

On the proposition of the CHAIRMAN, seconded by Mr. R. BERRIDGE, dividends were declared at the rates of 8 per cent. per annum on the preference shares and 6 per cent. on the ordinary shares, both less income-tax (except on dividends payable to local shareholders).

The CHAIRMAN then moved a hearty vote of thanks to the Secretary (Mr. S. Wood), the Local Secretary (Mr. F. A. Conyers), the Engineer (Mr. T. B. Younger), the Auditors (Messrs. Magnus Ohren and J. Manwaring), and the Solicitor (Mr. E. K. Blyth).

Mr. GANDON said he had much pleasure in seconding the motion, because he believed he had greater knowledge than the other Directors of what the officers of the Company had to do, as he had been out to Georgetown, and knew something of the trouble and difficulty they had in negotiating matters there. The present was a particularly anxious time for the officers, on account of the electric light. He, as a rule, worked on the electric light, as he believed it did gas some good; and he thought it would do so at Georgetown—at all events, they had not suffered very much from it as yet. He also bore testimony to the excellent manner in which the London officers performed their duties—especially Mr. Wood, who had succeeded their old and valued friend, Mr. Lass.

The motion was heartily agreed to.

The CHAIRMAN, in reply to questions by Dr. Woods, said that a considerable portion of the street-lamps had been handed over to the Electric Light Company; but he could not say whether they would lose any more of them.

Mr. GANDON remarked that there was only a small profit on the public lighting; so that the loss to the Company was not very great. So far as private consumers were concerned, very few had deserted them.

On the proposition of Mr. BLYTH, seconded by Mr. MAGNUS OHREN, a vote of thanks was passed to the Chairman and Directors; and the proceedings then terminated.

WEST MIDDLESEX WATER-WORKS COMPANY.

The Half-Yearly General Assembly of this Company was held last Tuesday, at the Offices, No. 19, Marylebone Road—Sir W. H. WYATT in the chair.

The CHIEF CLERK and SECRETARY (Mr. F. H. Wybroo) read the notice calling the meeting, and subsequently the report of the Company's Auditors. The latter stated that the cash balance in the hands of the bankers on the 30th of September amounted to £7186, less £542 outstanding cheques. The investments of the reserve fund were as reported last half year; and the repairs and renewal fund remained as before. The Company had also the sum of £115,000 on deposit at interest with the London and Westminster Bank, the Union Bank, the London Joint-Stock Bank, and the London and County Bank. The capital was the same as reported last half year—viz., £1,372,136; and the total expenditure on works amounted to £1,347,372, including £13,999 laid out in the half year. The gross rental for the six months ended Michaelmas came to £122,016; being an increase of £3869 on that of the corresponding period of the previous year. The water-rental was £105,952. The balance to the credit of the dividend and interest account was £147,616.

The CHAIRMAN, in moving the adoption of the report and accounts, said he need hardly tell the proprietors that the last half year had been a time of very considerable anxiety to the Directors of all the London Water Companies. They had had a great deal to think of, a great deal to do, and a great deal to prepare; and they had had this misfortune—that in the beginning they really could not get any information as to what would be required by the Royal Commission, or what they would have to be prepared with. They were therefore obliged to go more fully, perhaps, into matters than circumstances had proved to be necessary; but he did not think that they would have much cause to regret this. Of course, he could not for a moment prophesy anything; but still, upon a very careful perusal of all the evidence, he did not think anything had been adduced which could in any way damage the Companies. Certainly, those who had endeavoured to traduce them in every possible way had not gained much; and, so far as he could judge, they had not risen very much in the opinion of the Commission. The things they advanced were palpably extravagant—not facts, but the result of their own imaginations; and therefore he did not think, as he had said, that they had done the Companies very much harm. The expense which they had been put to had, however, been very considerable. They used to think, in going before Parliament, when they had to do with Counsel's expenses, that they were bad enough; but they were child's play compared with what had now happened. When they had engineers, chemists, geologists, and every other kind of expert, they seemed to have no control over them. They had put down the large sum of £3200 for expenses; and he hoped this amount would prove sufficient. But he did not believe anyone could tell them whether it was too much or too little. At the same time, he thought it was very satisfactory that they had not proved anything against the quality of the water supplied; and, further, that they had not adduced anything to show that the Companies, if left alone, would not be able to provide sufficiently for all future demands. This was his own impression; and the proprietors must be good enough to take it in that light, for the Commission might have a different opinion. He did not know what they would say or do; but, no doubt, some further expense would be necessary. In the course of time, there would be subsiding reservoirs to add—perhaps jointly with the other Companies, though he did not know that this would be the case. But even if it should be so, there would be an increase of revenue to meet the outlay; and therefore they would not suffer. This Company, too, was in a peculiarly fortunate position, because, if the worst came to the worst, they had from £17,000 to £18,000 a year to fall back upon in the shape of the rebate they allowed the consumers. They would be very sorry to take the rebate away; but, if circumstances compelled them to do so, the consumers must be prepared to stand the loss. He did not believe that, under any circumstances, London would ever be better or more freely supplied with water than by the present undertakings. All the Company's works were believed to be in the most excellent condition. The Directors never hesitated to spend money, as they could do, out of revenue, in keeping them in that condition; and he believed that the Company's Engineer (Mr. M. W. Hervey, M.Inst.C.E.), who was most careful and attentive in the matter, really did this. They had made a not unfavourable contract for coal; and, if all went well, they had arranged for enough to last for 18 months. Unfortunately, however, the contract contained the usual strike clause; and if the men in South Wales did what they said they would—go out on the 31st of December—the Company might have to buy coals on worse terms somewhere else. They had, however, done all they could do in the matter.

The DEPUTY-CHAIRMAN (Mr. J. Meyer) seconded the motion.

The CHAIRMAN invited discussion; but no shareholder rose to address the meeting.

The motion was therefore put, and at once carried unanimously.

The CHAIRMAN afterwards proposed the declaration of a dividend on the consolidated stock of the Company for the half year ending the 30th of September last, at the rate of 10 per cent. per annum, less income-tax.

The DEPUTY-CHAIRMAN seconded the motion, and it was agreed to.

A vote of thanks having been passed to the Auditors,

Mr. HUNTER proposed a similar compliment to the Chairman and Directors "for their diligent attention to the business of the Company, and for their able and satisfactory management of its affairs." There was no doubt, the speaker observed, that the Directors of the Water Companies had had a very anxious time during the past year. The Royal Commission was going so thoroughly into the questions of the source and quality of the water, and, in fact, into matters generally connected with the water supply, that he felt certain the public would at last learn the admirable services which the Companies had rendered to them, for he did not know how many years past. It seemed to him that, the more the facts came out, the better would be their position. He maintained that they had served the public admirably in every way; and he was quite certain that, if at any time their undertakings should be transferred to the Municipality, the work could not be better performed than it had been. He ventured to say that, so far as individual consumers were concerned, the work would be done in a manner which would be less satisfactory than at present, because, supposing the Municipality took over the water supply, they would have to think simply of the interests of the consumers generally, and would not pay any attention to individuals. The Companies, however, were bound to do this, or otherwise they would bring trouble upon their heads. He was certain that the Water Companies in London were in an admirable condition. This was shown by the death-rate; for it was impossible, with a bad water supply, to have such a death-rate as there was in London. He was convinced, too, that the quantity would be enough to satisfy Mr. Binnie in his largest demands.

Mr. FOWLER, in seconding the motion, expressed his conviction that proprietors in the Metropolitan Water Companies could feel perfectly assured regarding the position of their undertakings.

The motion was carried unanimously.

The CHAIRMAN, in acknowledging the vote, said he thought the anxious times which they had lately been going through might last a little longer; but he could promise the proprietors that the Directors would do everything in their power to protect their interests.

The proceedings then terminated.

CAPE TOWN DISTRICT WATER COMPANY, LIMITED.

The Ordinary General Meeting of this Company was held last Wednesday, at Winchester House, Old Broad Street, E.C.—Mr. J. S. PRINCE in the chair. The report submitted for the year ending June 30 stated that the gross revenue, which in the previous twelve months amounted to £3034, had increased to £5306.

The CHAIRMAN, in moving the adoption of the report, said he had much pleasure in addressing the shareholders, as he had a very favourable account to give them of the past year's operations and the future prospects of the Company. They had an ample supply of pure water for present and future requirements; and the population in the suburbs of Cape Town was rapidly increasing. This being so, he thought the future success of the Company was almost ensured; and he believed the advantages of a permanent water supply would be fully recognized by the inhabitants in their district. The gross revenue had exceeded that for the previous year by £2200; and the local Directors at the Cape estimated that the revenue for the current year would be £6500. While upon this question of revenue, it might be interesting to the shareholders to know the source from which the existing income was derived, and from whence the increase might be expected. At the present time, 832 houses were supplied by the Company, 626 more could be supplied without further extension of the mains, and an additional 589 could be served at a comparatively small outlay. This did not include the district of Woodstock, which was supplied in bulk through the Municipality. He thought these details would go far to prove that there was some solid foundation upon which to base a favourable forecast of their future prospects; and he might almost express the hope that, at the next meeting, he would be in a position to recommend a dividend upon the ordinary shares. If they could do this, they would accomplish what few large water companies had done at so early a period of their history. During the past year, 6720 yards of new mains had been laid; and new mains would be required in the current year. For this purpose it would be necessary to provide funds; and the Directors contemplated making a further issue of the authorized debentures. In the general profit and loss account, there was an item of £880 to which he ought to refer. This amount had been presented to the Company by Messrs. Findlay, Durham, and Brodie; and it represented profits which they had derived from their contract for pipes, engines, &c., above what they had estimated. It was at their request the sum had been credited to profit and loss account; and the thanks of the shareholders were due to them for their generous conduct. Referring to an action which had been brought against the Company by certain riparian owners on the Liesbeck River, he stated that this had been decided in the Company's favour, and a declaration given by the Supreme Court that all water flowing from the Albion Springs in excess of 500,000 gallons per diem was their property. As the Liesbeck yielded 1,200,000 gallons a day, there was a surplus of 700,000 gallons for the Company.

Mr. J. H. DURHAM seconded the motion, which was unanimously carried.

The retiring Director (Mr. Durham) and the Auditors (Messrs. Deloitte, Dever, Griffiths, and Co.) were re-elected; and the usual vote of thanks concluded the proceedings.

GAS AND ELECTRIC LIGHTING AFFAIRS AT BELFAST.

Opposition to the Extension of the Gas-Works—Adoption of Water Gas—The Proposed Electric Lighting Installation.

A deputation of ratepayers waited upon the Belfast Corporation, at their quarterly meeting last Tuesday, to express their views with regard to the extension of the gas-works in Ormeau Park. Messrs. J. Craig and J. M'Cormick were the principal spokesmen. Mr. Craig stated that the deputation represented a large section of the ratepayers, who objected to any extension of the gas-works in either the Ormeau Park or the Glentoran grounds. The Ormeau Park, they considered, belonged to the public; and to take any portion of it away for the purpose of erecting gas-works thereon would be ruinous to the health of the neighbourhood. It was hardly fair, when they had a pleasure ground for people in humble circumstances to amuse themselves in, to deprive them of what people in higher circumstances could get easily—fresh air and amusement. Electric light was talked about for some time; and he understood that a Provisional Order was obtained about three years ago. So far as the ratepayers were concerned, it had remained a dead letter ever since. There was another feature he would like to mention; and it was this, that the small consumers were those who had paid the profits of the gas-works since they had been in the hands of the Corporation. If the works were extended, there would doubtless be some other business in the shape of chemical works carried on there too; and Ballymacarrett had a long enough experience of such work. He had been in communication with Messrs. Siemens and Co.; and he had it on the authority of a practical man, that electric light would not cost more than gas; while the outlay for putting down the plant would not be half of the expense of extending the gas-works. That gentleman was prepared to prove this statement before a meeting in Belfast. Mr. M'Cormick mentioned that the works ought not to be extended either in Ormeau Park or at Glentoran; and he entirely rejected the proposition that there were no other suitable sites. He also repudiated the statement that they were actuated by sentimentality. He challenged any gentleman to go into the neighbourhood of the existing works, and not be made painfully aware of the various smells emanating from them. "Even the houses in the neighbourhood," he impressively added, "were stained and smoke-begrimed. The noxious exhalations would destroy the foliage of the trees, the verdure of the grass, and the brightness of the flowers; and the effect would be that they would destroy everything of beauty in the park." He could even fall back upon the decision of a Court of Justice made six years ago, when a number of gentlemen residing in the vicinity, of whom Alderman Graham was one, began an action against the Corporation. The case was fought most bitterly; and, notwithstanding the evidence of the Corporation, the Recorder found for the plaintiffs. Defendants then appealed to the Judge of Assize, who came to the conclusion that the Recorder was right, and affirmed his decision. Most of the gentlemen who advocated the extension were able to live in suburban and seaside places; and of these he would like to know if they would care to have a gas-works planted on their pleasure ground. Before a large sum of money was expended on gas-works, he urged that they should give a fair trial to the electric light; and they would by this means relieve the existing pressure. The large streets, mills, and shops he believed would apply for the light; and they could not doubt that this would mean a great reduction in the existing demand for gas. The Lord Mayor (Sir Daniel Dixon) assured the deputation that their views would have the consideration of the Council; and he added that, if the works were to be entered upon, it would not be without asking the opinion of the people on the subject. Mr. Barklie, a member of the Council, said he gathered from a statement made by the Chairman of the Gas Committee at a meeting the previous day, that it was not their intention to proceed with the extension of the gas-works, they having made arrangements to supply water gas, which it was calculated would stave off the extension for another twelve months. Alderman Connor said he did state at the meeting referred to that the Committee had made arrangements to supply 1,500,000 cubic feet of water gas daily. He did not, however, say that this would be sufficient for another twelve months; and it would not in any way do away with the urgency of the extension of the works. The deputation then retired.

On the day preceding the Council meeting, a public meeting of ratepayers was held to discuss the question. A resolution was moved by Mr. M'Cormick, protesting against the erection of gas and chemical works in Ormeau Park or the immediate vicinity, and condemning the proposal of the Corporation to take a vote of the electors on two sites only—viz., Ormeau Park and Glentoran—as misleading and involving false issues; and expressing the opinion of the meeting that an adequate installation of electric light would largely, if not wholly, obviate the necessity for an extension of the gas-works. The resolution was seconded by Mr. Hunter; and, among subsequent speakers was Mr. Harrison, who contended that, if the electric light was to be fairly tried, it must not be controlled by the Gas Engineer (Mr. J. Stelfox) or the Gas Committee, which he characterized as the "most reactionary and illiberal" of all Committees in the Corporation. He urged the appointment of a Special Sub-Committee of the Council to deal with the matter and secure for the electric light a fair and reasonable trial. The resolution was agreed to.

In the JOURNAL for the 25th ult., we reported the conclusions arrived at by a Committee who had had the question of an electric lighting installation under consideration. They were of opinion that the time had come when an installation capable of supplying (say) 10,000 incandescent lights, and of future extension if found desirable, should be undertaken. The report came before the members of the Council at the meeting referred to in the first paragraph. The motion for its adoption having been moved and seconded, Mr. Young thought the installation of 10,000 lights, approved of by the Committee, inadequate. It should, he maintained, be at least five times that number; and he moved that the report be amended accordingly. Mr. Wilson seconded the amendment; and then Mr. W. M'Cormick gave some particulars as to the progress made by the electric light at Bradford, Leeds, and Rochester. In reply to a question, the Town Clerk stated that the money for providing the electric light would be taken from the gas funds; and at present he thought they had a surplus of something like £70,000. The amendment was rejected by 11 votes to 20. A further amendment was proposed, to the effect that the installation should be increased to 25,000 lights; but the Town Clerk explained that, so far as he knew, the electric light would be more than three times the initial cost of gas, and consequently to light the streets with it would be three times the present cost. If the ratepayers were prepared to spend the rates in this way, the Corporation could light the streets for them; but it was not intended to do so at first. The streets, moreover, were at present very well lighted. This amendment was also negatived; and the original motion was then passed.

THE PRICE OF GAS AT PRESTON.

Deputation of Gas-Engine Owners to the Gas Company.

Last Tuesday, a deputation, representing owners of gas-engines in Preston, waited upon Mr. Henry Green, the Engineer and Secretary of the Gas Company, with the view of obtaining a reduction in the price of gas used for motive power. The spokesman was Mr. Holland; and he pointed out, at the commencement of the interview, that the deputation had not come to discuss the question of the charge for gas generally, but to express their opinion with regard to that which was used for power purposes, and to ask that it should be sold at the lowest possible figure to those who used it in this way. They thought it should be supplied to them cheaper than to the ordinary householders, for various reasons. He considered that a poorer quality of gas would do for power users than what was required for lighting purposes; and it would be employed when mills did not require it—viz., in the daytime. It would also be used all the year round. He cited Manchester as a case where a differential rate for gas-engine users is in contemplation. He incidentally mentioned that there had been some talk of forming a separate company—not at all in contravention of the Act of the existing Company—for the purpose. He and those who were with him thought it was scarcely intended, when the Company was established, to supply gas for driving machinery at the same price as for illumination. Mr. Green remarked that nothing was known about gas-engines when the Company commenced operations in 1815; and that what might have applied then was not applicable now. With regard to the supply of gas of a poorer quality, it would necessarily be cheaper than lighting gas, but there would be considerable difficulty in making it. A very large amount of money would have to be spent on additional works before this would come to pass; besides, there would have to be an enormous expenditure of capital in other ways. Already the Company were found fault with for laying out too much money; and if they were to spend more capital, as would be necessary to supply a different kind of gas for engines, there would be still more complaint. He then went on to deal generally with the points laid before him. He said he was anxious to have the views of the deputation, so that they might be submitted to the Directors and properly considered. A great deal of time had been devoted to the question of the price of gas; and it was thought to be unwise to have different rates. He was aware that this was done in some towns, but not in many similar in size to Preston. What the Directors had to consider was this—whether the people who burnt gas in the mills, and paid bills amounting to £200 or more per quarter, would not have proper ground of complaint against the Company if they made differences in the rates. He questioned, too, whether any company could legally do what was suggested. His feeling about it—and he thought it was the feeling of his Directors too—was that it would be creating a preferential rate; and no company was allowed to make this. It would be giving one customer an advantage over another. If he were a large consumer of gas in a mill, and paid a very high gas bill, he should feel aggrieved if another consumer, burning less gas, were charged at a lower rate; and he would probably take some action to remedy the defect. He was inclined to think that the law would be against them, and that the Company would be called upon to refund the difference. When he first became connected with the Company, the price was the same to all consumers, but discounts ranging from 30 down to 5 per cent. were allowed, according to the quantity burnt. With the view of encouraging small consumers, they brought the 30 down to 20 per cent., and raised the 5 to 15 per cent. The result was that the smallest consumers were placed on the same footing as the largest. He did not say that his Directors would or would not do what was asked; but he thought of the difficulties they would have to contend with. If, however, they were satisfied that something ought to, and could be done, they would do it. They would consider the matter on its proper merits. The main point in favour of the deputation was that of the day consumption of gas. Mr. Toulmin (one of the deputation) remarked that the Electric Light Company were allowing 15 per cent. for day consumption. His firm were putting in three gas-engines, which they would not have done if they had known the price of gas was to be raised. Another member of the deputation thought it would be good policy on the part of the Company to form another company for the purpose of keeping the gas-engines together. There was, he said, a difference between Preston and Birmingham. In the latter town, the charge to consumers of upwards of 20,000 cubic feet of gas was 1s. 9d. per 1000 cubic feet, as against 2s. 3d. to ordinary consumers. Mr. Green pointed out that this did not affect the question before them; it was not a preferential rate. The main point to be decided by his Directors was one of policy as between one consumer and another; it was not so much a question of encouraging the thing from an engineer's point of view, because his Directors thought—and he quite agreed with them—that serious trouble with the consumers would in all probability arise, if they made a difference in the rates. This was really their difficulty; and he thought some of the places in which different rates were adopted would experience it sooner or later. In Preston any consumer burning less than 2 million cubic feet of gas must be treated on the same basis, and those taking more than this quantity on another basis. Mr. Toulmin remarked that the Company made it "big enough." Mr. Green replied that they did so to encourage

the smaller consumers like the members of the deputation. Mr. Holland again urged that the Company ought to take into consideration the circumstances that a cheaper and commoner gas would do for them. Mr. Green replied that, if the Company could make such a gas for the purpose in question they would do it; but, as he had remarked, it would involve a further heavy expenditure of capital. They had therefore to be satisfied with the gas they made. After some further conversation, Mr. Green assured the deputation that it had not been without the most anxious consideration that the Company had decided on the step which had been complained of; but they had been forced to take it. He hoped, however, they would soon be able to bring it down again. The deputation thanked Mr. Green for his courtesy; and the interview terminated.

THE MANAGEMENT OF THE DARWEN GAS-WORKS.

At the last Meeting of the Darwen Town Council, there was an interesting discussion on the subject of the gas undertaking. It arose on a motion proposed by Mr. Tomlinson in the following terms: "That this Council, having in view the proposal lately made by Mr. Davies (Chairman of the Gas Committee) to advance the selling price of gas, together with his statement that there had been a loss of several hundred pounds for the years 1891 and 1892, and that there would probably be a further loss for the years 1892 and 1893 unless such proposed advance was agreed to, this Council instructs the Gas Committee to report, through its Chairman, the cause of such recurring losses, and whether it be not possible for the Gas Department to balance its accounts without having recourse to an advance in the selling price of gas." In view of the discussion, Mr. Tomlinson had circulated a sheet of figures he had compiled, giving a comparison as to the cost of gas between Darwen and Blackburn—the cost of making, &c., under the control of the Manager, and beyond his control. The comparisons show that in Blackburn, in 1892, the gas sold amounted to 510,003,500 cubic feet; realizing £72,969, or 2s. 10·3d. per 1000 cubic feet. In Darwen, for the same period, the gas sold amounted to 122,957,000 cubic feet; realizing £19,056 19s., or 3s. 1·1d. per 1000 feet. In a circular-letter which Mr. Tomlinson sent with the figures, he said he had taken this course in order that the Council might see how the expenditure was allocated. Mr. Davies (following in the wake of Alderman Lighbown) recently stated that they made gas cheaper than at Blackburn; but that they suffered to the extent of some pence per 1000 cubic feet made, in consequence of disabilities beyond the control of the Manager, as compared with Blackburn. In moving his resolution, Mr. Tomlinson said most of his hearers were aware how it had risen. It was a difference of opinion as to whether they were making gas as cheap as Blackburn, and whether their works were as well looked after as they should be. Mr. Davies said he was not aware that he had ever submitted a motion to advance the price of gas. Mr. Tomlinson said it was known to all that in Committee Mr. Davies made a proposal for an increase; but that the Council refused to accept the recommendation. Mr. Davies said it was a Sub-Committee who made the recommendation. Whether or not he made the proposal when it came before the General Purposes Committee, he did not know; but it was rejected. Mr. Davies went on to examine Mr. Tomlinson's figures, which he said were misleading. It appeared to him that Mr. Tomlinson had tried to make their own gas undertaking look as bad as possible; while, on the other hand, he made Blackburn appear very good. Mr. Tomlinson had put down things as being under the control of the Manager which were not. With regard to unaccounted-for gas, it was more this year than it had been for seven years past. A big escape had been discovered at Hoddlesden; and the Manager told him they could never hope to reduce the leakage for the reason that Darwen was undermined. As an instance, he might mention that eight mains had broken during the past month. Another reason why the leakage could not be reduced was that full pressure had to be kept on during the night for the paper-mills, where work was continually carried on. He moved, as an amendment—"That the Council instruct the Gas Committee to report through its Chairman the cause of such recurring losses, and whether it be not possible for the Gas Department to balance its accounts without having recourse to an advance in the selling price of gas." Mr. Tomlinson withdrew his motion in favour of the amendment which, he said, was all he wanted. He wished for a report on the gas-works. The amendment was put and carried.

Monte Video Gas Company, Limited.—The Directors of this Company have declared an interim dividend of 2½ per cent., free of income-tax, for the six months ending June 30 last.

Extension of Electric Lighting at Brighton.—The most important matter for discussion at the meeting of the Brighton Town Council yesterday week was a proposal of the Electric Lighting Committee to extend the Corporation area of supply, so as to embrace about two-thirds of the town. Objectors to the scheme urged that its adoption would lead to an enormous outlay, and that there was no justification for entering upon this until the Council had been placed in possession of the financial result of the trading in the present area. Alderman Moon, Chairman of the Electric Lighting Committee, regretted that no full financial statement could be presented until the accounts had been made up to the end of the year, and asserted that although, as expected, there had been a loss on the present undertaking, amounting to £300 in the last three months of 1891, £650 in the first six months of this year, and a slight loss in the third quarter, a profit was now being made at the rate of £900 a quarter. The success was far greater than they anticipated. He explained that, although they asked for power to cover two-thirds of the town, they would only supply the light where there was a prospect of doing good business; and they already had many applications. It was pointed out that agreement to the motion that day would not prevent objection to the estimates for further work later on; and, in the end, the Committee's report was adopted by a large majority.

THE METROPOLITAN WATER SUPPLY COMMISSION.

(*Lord* BALFOUR OF BURLEIGH, *Chairman; Sir* G. B. BRUCE, *Sir* A. GEIKIE, *Professor* DEWAR, *Dr.* W. OGLE, *Mr.* G. H. HILL, *and Mr.* J. MANSERGH, *Commissioners.*)

Twenty-first Day—Thursday, Oct. 20.

Professor *Boyd-Dawkins* was recalled this morning to continue his evidence. In answer to Sir A. GEIKIE, who asked him whether 18 inches per annum might be taken as the amount of the sinking of the water-level in some parts of London, he stated that this figure related to the general sinking of one particular well. They could not assume that 18 inches was the average rate over the rest of London, for it was extremely irregular. The only continuous series of observations that had been made were those at the Hampstead Road well. He was afraid he could not give any figure as an average rate, as the mass of information which bore upon this point was so great. The water-level, beyond all doubt, had been, and was still falling. With reference to the supply of 50,000,000 gallons a day, which he thought could be obtained, and which was less than 6 per cent. of the whole percolation of 840,000,000 gallons per day, he said he meant to include the water that passed down into the chalk over the entire Thames basin. He should not think that the whole of this water would be available. A great deal of it flowed into the river; and it was impossible to tell exactly how much of it escaped through the mass of the chalk. It was quite impossible to estimate what proportion of the 840,000,000 gallons found its way by springs into the Thames. With regard to the springs of which he had spoken, they were very powerful. One of the more important heads of water came into the Thames at Erith. There the head of water was sufficient to prevent any accumulation in the river of the sewage mud which elsewhere collected very largely. There were other springs which flowed into the Thames; and the head of water to the east of Erith was so great that they could not make the foundations of the houses at a level much below Ordnance datum. He would propose that some deep wells should be placed within the area of the Lea, and others in the districts of the East London and Kent Companies. He thought also there was plenty of room in the upper portion of the various rivers for a series of wells. By putting down deep wells, they could get a very large additional supply of water in the eastern parts, and on both the north and south sides of the Thames.

The CHAIRMAN: As I understand, Sir A. Geikie's point is as to how you are going so to arrange the position of your wells as to spread equally over the district the water you will take, and so lower the level over the entire district, instead of lowering it six inches in one place, and nothing in another.

Witness said he did not think this would be possible. Continuing, he stated that he did not believe any great additional quantity of water could be obtained from the lower greensand within the Thames basin. With regard to the capacity of the Waltham Abbey well and the Broxbourne well, and the estimate that it was possible to sink into the chalk new wells capable of yielding at least 30,000,000 gallons of water a day, he said the figures had been obtained from the engineers, and were the result of actual experience. About 4,000,000 gallons per diem might be drawn from the Broxbourne well. He should have no difficulty whatever in planting in that area (say) ten wells, which would probably yield not less than 3,000,000 gallons of water daily. He based this opinion on the quantity of water which he knew to be in the chalk, and on the experience acquired by the river Companies in the sinking of wells. If all these assumed quantities were taken from the wells, the surface water would be brought down; but he did not believe that the abstraction of a given amount of water from the deep wells would lower the surface water *pro tem.*, because in a great many cases they would not get into the surface drainage at all, and some water would in all probability come from areas very far from it. In the district of the Kent Water Company, he was confident an additional quantity of 10,000,000 gallons per day might be procured. The enormous bulk of water which was now finding its way into the Thames was evidence that they had not gone beyond the limit in that district. Asked as to the lowering of the water-line in the chalk, and reminded that he spoke about being unable to agree with the evidence that the general level of the water in the rocks outside London would be lowered, witness admitted that he had investigated the matter as far as he could. It was an extremely difficult one; and the time at his command since the inquiry assumed its present shape had been very short. With regard to the evidence about the River Lea, he should be inclined to say that he did not know of any to show that the general water-line had been lowered in the northern parts. Taking the district from Enfield northwards, he was not aware that there was any evidence whatever to show the general lowering of the water. With reference to the district on the south, he had no absolute proof; but he thought there probably had been some very slight lowering, though he could not give it a numerical expression.

Dr. OGLE: Can you furnish me with the data on which you base the estimate of 10,000,000 gallons a day as the amount of water pumped from wells in London?

Witness: I take it on the statement of Mr. Whitaker. I have no special means of knowing what it is.

Examined by Mr. MANSERGH, witness stated that between Deptford and Erith the water-line in the rocks on both sides of the Thames descended to the level of the river; so that it was perfectly clear, from the examination of the levels, that the water found its way to the river. On the south side of the Thames Valley, there were a number of works which derived their water from the wells and from the chalk. Besides these, there were a series of chalk quarries all along both sides of the Thames; and these could not be worked much below a foot or two above Ordnance datum. He could cite a case at Northgate where the water pumped was 1,800,000 gallons per day; and there were numerous works of this magnitude and others of which he was not able to say whether or not they pumped the same quantity of water. It was clear, however, that all this water was finding its way into the Thames. There was a very large number of works, fringing the north side as well, getting their water from the chalk and the gravel.

Then they had evidence that there was a connection between the chalk and the Thames. Further down, in the district of Grays, there were wells of which the capacity was not less than 7,000,000 gallons a day. Then there were the springs farther to the east, which were gushing out of the chalk. He should like to say that from Folkestone, where the grey chalk met the sea-level, down to Dover, there was only one large spring, and this came out in a fault.

Mr. MANSERGH said he observed that the witness divided the water in the chalk into two classes—percolation water and storeage water. In regard to the latter, he noticed that it was remarked that for each square mile, assuming the chalk to be 300 feet in depth, there were 16,727,000,000 gallons of water. Multiplying this figure by 2100, the square mileage of the area with which the witness dealt, they, of course, had an enormous quantity of water which would supply London for about 350 years. Was this water available in any sense whatever?

Witness said he meant that a great deal of it was available. It would be a question simply of time and of water pressure from without upon the water in the chalk—water on the surface of the chalk forcing out the water in it, and, of course, taking its place. But deep wells would help them. There was capillary action; and he thought the water was slowly to be got into the fissures of the chalk. The deep wells drew into it; and, in the course of time, there was "weeping" from the general mass of the chalk into the fissures. The water of which he spoke was, he maintained, to be looked upon as in the nature of a reserve. It being suggested that the enormous quantity of water which was locked up in the chalk, as described, was not available at all, witness said he considered that they drew upon the deeper chalk water, which he took to be storeage water, and that percolation water took its place.

In reply to Mr. HILL, witness agreed that the delivery of water from the chalk was being greatly changed by the abstraction of water in pumping, and by wasting away of the chalk as well. Theoretically, he said, it must be so. The abstraction and wasting away would probably also minimize the dry-weather flow on the surface; but he did not know of any damage having yet been done.

Mr. HILL pointed out that there was evidence that the Ravensbourne had been losing water since the establishment of a new pumping station for the Corporation of Croydon, and, no doubt, it was affected by one of the Kent Company's stations. He was considering this—that, so long as they abstracted a small amount of water from the chalk, the fissures in the rock were not materially changed, because there was not a great flow through them; but when they abstracted a large quantity, and the fissures, owing to the discharge of large quantities of water through them, began to enlarge, was there not danger that the change of circumstances would affect the surface water?

Witness said he did not know that there was any evidence of danger, On his attention being called to the case he had just cited, he said he did not dispute the fact that the surface waters were lowered by the pumping. They must necessarily be. If the demand for, and the supply of water were quite equal, they would not incur disastrous results; but the moment they passed the line of equality they might do so. He did not, however, think they had passed it yet.

Mr. HILL remarked that this was not the view taken by some people in the Lea district.

Examined by Sir G. B. BRUCE, witness mentioned that what he regarded as available water in the chalk was a portion only of the percolation into it. He had said that some wells were sunk in the chalk which drew their supply from a considerable distance, and would not affect the surface water or streams in the immediate neighbourhood; and certainly it was his opinion that there were layers of water-yielding chalk, separate from the water-bearing layers above them, from which water might be drawn without reducing the flow in the surface streams. That was to say, there was some water percolating into the chalk which perhaps never found its way into the streams until it came to the Thames itself. This, he added, was especially the case where the impervious London clay was over the chalk.

Sir G. B. BRUCE: Suppose a well was sunk right down to the lower strata, and the water was shut out from the upper layers, could you get water out without affecting the water-bearing strata above?

Witness: I should think so, probably.

In answer to the CHAIRMAN, witness remarked that he could not help looking upon the chalk as a reservoir continually replenished from the surface. He believed that the quantity of water yielded from the chalk was ruled by the percolation into it. The chalk was a reservoir.

The CHAIRMAN: Supposing in one year there is a larger rainfall, and consequently, according to your view, a larger percolation, do you think that the storeage in the chalk is increased in that year, or does the water emerge from it in an increased outflow?

Witness said he took it that the storeage was increased. Asked how he satisfied himself that the more abundant rainfall did not result in an additional escape of water, he observed that the question of escape through the mass of the chalk was not so much one of water as of the size of the fissures in the chalk. What could not be taken up by them flowed over the surface.

I wish to understand what the evidence was which satisfied your mind that, in a year of increased rainfall, the amount of water in the chalk at the end of the year is increased?—It was simply that more water percolates into the chalk during such a year; and, the water channels being of a definite water-bearing capacity, the chalk can only pass through its mass a certain quantity of water in a given time.

But, of course, even assuming you get 10 inches of percolation, the 840,000,000 gallons include the whole that now escapes?—I should say so.

And more will escape, I suppose, at the seasons of the year when there is a greater amount of rainfall?—Slightly so; but there, again, it is a question of the size of the fissures.

Some of the 840,000,000 gallons must escape into the Thames?—Certainly.

You do not adduce any figures as to what the capacity for supply of this chalk would be, over and above what we are now getting?—For the very simple reason that I am not able. Our knowledge of the water in the chalk is of an extremely concentrated character.

Whatever of it was to be obtained, would it, as I understand you, be done by the sinking of deep wells?—Yes.

Questioned next as to the considerations which would guide him in selecting sites for these wells, witness added that he should look to the area of the chalk behind the wells—that was at a higher level, and also to the question of population. As far as possible, he would avoid putting the wells near populous parts. He would not put one in the area of London, for instance; he would not put one where it was likely to be affected in any way by (say) the surface water from large centres—in an area where there would be any possibility of surface waters getting down. He would look to areas where there was the least draw by other wells; but how far he would go from existing wells would depend entirely upon the conditions of the case. Concerning the effect upon the surface streams of pumping from the deep wells, it was probable that, while it would not have any effect upon the streams above the sites, it would upon those below; and pumping 3,000,000 or 4,000,000 gallons of water daily from a deep well might affect wells higher up in the same strata. With regard to the suggested sites for the proposed storeage reservoirs, he repeated that he thought they were the best that could be had under the difficult circumstances of the Upper Thames; and some of them appeared to him to be perfectly good and water-tight. No. 1, on the Windrush, above Burford, was, in his opinion, on a most excellent site, because the bottom was a perfectly good foundation, and the reservoir would be large. He did not apprehend that much difficulty would be offered there by leakage. In the main, its foundation would be on the lower lias clay; and this was to be depended upon as being impervious. Reservoir No. 2 would not, he thought, be water-tight; but the leakage through the bed might be met by having wing trenches, and on the eastern side it would flow into reservoir No. 1. Reservoir No. 3 might be made a fairly good working one. He saw no special difficulty in making it sufficiently water-tight. If the leakage proved to be considerable, he did not see why it should not be met by wing trenches. On being reminded that it was suggested, in regard to this reservoir, that the bed was pervious, and that long wing trenches would be required to prevent the water flowing away, and that, in fact, it might be necessary even to surround the whole reservoir with a puddle trench, witness said he hardly looked forward to this, having regard to the condition of the rocks, which were water-logged, and further to the fact that there was in those rocks a large pool not very far off. As to the sites on the upper waters of the tributaries of the Evenlobe, knowing the geological character of the oolites, they looked extremely doubtful; but viewed with the experience of the large lake in Blenheim Park, there was every reason to suppose that reservoirs could be made to hold water at all events as well as that lake could.

The CHAIRMAN, directing witness's attention to site No. 4, said he was in this difficulty: He had two criticisms—one by Mr. Woodward, who said the bed of the reservoirs would be on the lower lias clay, and that no escape of water was to be apprehended; and the other by Professor Green, who said the reservoir would be wholly on porous marlstone, and could not be made water-tight by any methods practically available.

Witness said there could be no manner of doubt that the foundation was lower lias clay.

The CHAIRMAN next pointed to a similar difficulty about reservoir No. 5. He saw Mr. Woodward had stated that it would be situated in a valley of lias clay, and would be practically water-tight; whereas Professor Green said a portion of the bed and a large part of the dam would be on porous marlstone, which might be rendered water-tight, though expensive methods would have to be resorted to.

Witness remarked that he should believe Mr. Woodward's view to be the accurate one, on the facts. He was unable to see any other conclusion, after examining the ground.

Mr. *A. H. Green*, M.A., Professor of Geology at the University of Oxford, was then called. In answer to the CHAIRMAN, he stated that in his evidence he wished to confine himself entirely to that portion of the Thames basin which lay to the north-west of the chalk escarpment. He had come before the Commission in order to deal with the question of the possibility of constructing reservoirs in the upper part of the Thames basin, as he had spent a good deal of time last year in examining the locality with this particular object, in consequence of a request of the London County Council. More recently, in company with Mr. Binnie, he had made a very careful examination of the sites of the reservoirs proposed by Messrs. Marten and Rofe.

Sir A. GEIKIE asked witness if he had considered whether or not any additional supply of water could be obtained from the upper portion of the Thames basin; and he replied that he had himself come to the conclusion that it was hopeless. He saw very clearly that, in certain parts of the limestone districts, there were many valleys abundantly supplied with water; and there were sites among them where, owing to the shape of the ground, it would be possible to construct a dam which would collect large quantities of water. But he also saw that this limestone was so opened and fissured that it seemed absolutely hopeless to make these reservoirs water-tight, except by means of works of great magnitude, and at an enormous expense far out of proportion to the quantity of water to be obtained. Then again, in the clay districts, he noticed that the valleys were broad, with gentle slopes; and, in order to preserve any quantity of water, they would require to have very long dams and the reservoirs would most of them be shallow—in fact, he concluded that certain reservoirs might be made which he would prefer to call "overgrown puddles." There were other places where they could impound larger and deeper masses of water; but the receptacles would not be water-tight. Asked if he thought there was a possibility of adding to the London Water Supply from springs or wells sunk in the upper part of the Thames, witness replied that he did not go very carefully into that matter. With regard to the question of springs, he said he would point out that it was one which could only be properly discussed after a long series of very careful gaugings. He did consider those which went out of the chalk escarpment; and most of them seemed to him to be not very large in volume. He believed that there would be great difficulty in storing the water from them, and that the water was already largely appropriated. The quantity discharged from the springs was, no doubt, very large indeed; but he had confined himself to the question of how it could be collected and stored. In regard to the proposed reservoirs in the clay districts, a very large proportion of

the land would be pasture, which was to some extent manured. He could not say that the districts were thickly populated. The suggested reservoir on the River Windrush lay in a broad valley, the flat bottom of which was formed of the lower lias clay—a perfectly impervious stratum, which might be relied upon to hold water; but the reservoir water at the southern end encroached on the middle lias. He agreed with Mr. Woodward, who stated, he believed, that this middle lias could not be trusted to be water-tight, that the rock was thin and fissured, and that the loamy sands could not be looked upon as actually impervious. There was the further difficulty to be met of the water getting round the puddle walls, and escaping that way. This, however, might be met by the construction of wing trenches. To make the thing absolutely safe, the wing trench on one side would have to run about a quarter of a mile along, and very much the same on the other side. The maximum depth of water at the lower end was given as 44 feet, and the length of the reservoir as about 2¾ miles. For the upper three-quarters of a mile, there would only be 12 feet of water in the reservoir; and when the water was down, there would be a noisome swamp, which would be very pernicious. He considered this site represented, in its most typical form, all the disadvantages of placing a reservoir in a broad, flat valley. The Sherborne Stream site was situated almost entirely on the limestone, which was a very porous rock; and the inferior oolite surrounded it for a great distance. The puddle trench would there have to be carried through the whole of the inferior oolite down to the middle lias clay. His impression was that the only way of making this reservoir was with a kind of wing trench all round. In the River Cherwell site, as far as he could judge, the maximum depth of water would only be 35 feet; and it was proposed to make the reservoir four miles long. He thought the sides were too steep to allow any of the natural puddle to lie upon them. Along the sides of these valleys, the bare limestone rock cropped out to the surface. The Sor Brook reservoir rested on porous marlstone. A portion of the bottom was on the lias clay; but towards the lower end of the reservoir, where the pressure would be greatest, a very large portion would be formed of this porous marlstone. The sides at the lower end were almost entirely of marlstone. A good deal of the River Swere site rested very largely on the lower lias clay; but it touched the marlstone along the southern margin and part of the lower end. A considerable portion of the bed would be on the porous rock; and therefore it would be very difficult to make this reservoir water-tight. The site on the stream near Deddington, as far as water-tightness went, was not open to any serious objection. The spot selected, however, was a horribly shallow plain 2½ miles long; and the upper part would be a swamp. With regard to the Dorne and Glyme sites, nothing, in his opinion, could be more misleading than to cite the lake in Blenheim Park as an illustration of their fitness to hold water. The formation of the ground in all three cases was identically the same. In each they had a long, narrow, steep-sided valley with a flat bottom, which was covered with an alluvial deposit, which might be considered fairly water-tight; but the sides on the steeper parts of the valley were practically bare rock. He did not think a clay residue would lie on a slope like that, which was one of perhaps 20 degrees. According to soundings taken, it was found that the Blenheim lake varied in depth from 14 to 20 feet. The water rested on a naturally puddled bottom, under which a certain quantity of water leaked and reappeared lower down the stream. It would not be possible, in the case of the Dorne and Glyme sites, to prevent the water from escaping. The Thame reservoir, at Hardwick, would be perfectly water-tight, but shallow; and in this case there would not, he thought, be any difficulty in making it.

Mr. *W. Whitaker*, F.R.S., Senior Assistant on the Geological Survey, stated that he had personally carried out and superintended the greater part of the survey of the valley of the Lea; and his official knowledge extended over something like 35 years. In conjunction with Professor Green, he had prepared for the London County Council a report upon the subject of the present inquiry. He very much doubted whether water-works could be constructed in safety in the superficial deposits themselves. He was personally acquainted with some of the largest wells by which water was obtained from the chalk. He did not think they had reached the limit of safety in the quantity of water taken from them; and his opinion was that the Company might draw large additional supplies from the chalk. The water coming up through London in that way he estimated at 10,000,000 gallons per day. He thought the Kent Company in particular could increase their supply to a very large extent indeed by extending their works to the east. The other two Companies—the New River and the East London—were in a somewhat different position. They had both of them large works along the Lea Valley; and if, according to the estimates put forward, they pumped 30,000,000 gallons of water daily, they might, he thought, seriously interfere with the springs. They would also affect the upper waters of the Lea; but it was a question how much they would do so. He did not see how they could possibly take a larger quantity of water out of the chalk without its having some effect upon the streams. The abstraction of 30,000,000 gallons would interfere with the outflow of the higher streams, and more seriously than with the lower ones, because the water in the former broke out at a much higher level. He did not think they would get any chalk available on the north of the Thames; it was all London clay. The chalk was buried under a great thickness of this clay; and there was a very considerable pressure on the chalk, which would certainly tend to close the fissures in it, and to stop the flow of the water. Again, in London they were at the bottom of an inverted arch—at all events, the upper beds of the chalk were; and even a very slight disturbance would squeeze the fissures together. Those who had been drawing on the chalk under London had been drawing from their capital, so to speak, more rapidly than from those parts of the chalk where the percolation was easier. He was of opinion that a series of wells might be put down with success at or near any part where a tributary of the Thames passed through chalk to the tertiary formations.

The CHAIRMAN: I understand you do not think that a further supply of water for London can be obtained from wells in the chalk?

Witness: If I were given the requisite powers, I would certainly undertake to supply London for many years with water from the chalk wells; but I would at the same time guarantee that most of the tributary streams would be dried up. It would not be possible to do the one without the other. Outside the Thames basin, there are three districts to be considered in view of getting a supply of water from the chalk—West Norfolk, East Kent, and the intermediate and enormous plain between the London and Hampshire tertiary beds.

If water is pumped out from points where these wells are situated, the cones of depression caused by those pumpings will attract water more rapidly down through the chalk than would be the case if there had been no pumping?—Yes. The general result of my investigations goes to show that the area of chalk gathering-ground is not so great as has been estimated.

In answer to further questions, witness said he admitted that the abstraction of 10,000,000 gallons of water alone, which was the quantity the New River and East London Companies claimed to pump, would not have a material effect upon the chalk.

Sir A. GEIKIE said what he wanted to get from the witness was something about what he considered to be the capacity of that great chalk region—the areas of chalk that lay to the north and west of the Thames, which were being used, or which might be used, by the Water Companies—for yielding an additional supply of water for London.

Witness said the capacity was undoubtedly enormous.

Is it your opinion that a large additional quantity of water could be obtained for London by works carried out in that north-western area?—It might be obtained, certainly. As far as the mere practicability of obtaining it is concerned, there is no doubt about it. I do not suppose anyone would deny that a large amount of water could be procured from the chalk in the Thames basin. A series of wells might be sunk at or near any part where the tributary streams pass from the chalk to the tertiary beds. My object in placing them there would be that I might have as large an area of chalk behind me as possible, and get the wells as low as practicable.

I suppose you could hardly venture to give us anything like an approximate estimate of the quantity of water that could be obtained by means of wells sunk there?—If you will allow me to put it generally, as a personal expression of opinion, I would state the whole question in a sentence, and I would say: Give me the requisite powers, give me the needful staff of engineers to design and carry out the works, and I will undertake to supply London for many years with water from chalk wells; but I will also undertake at the same time to dry up most of the tributary streams. It is not possible to construct wells in the area of chalk to the north-west on the left bank of the Thames, and obtain large supplies of water, without affecting the surface streams.

Questioned as to what effect the pumping from the wells had had upon the surface streams, taking the area of the south of the Thames near London, witness stated his belief that the Kent Company's pumping, as he understood was allowed, had more or less lowered the springs in the Cray Valley near by. One of their pumping-stations was very near the starting-point of the Cray; and parts that used to be more or less springy were now very rarely so indeed. Asked where, if any additional supply of water was to be obtained for London, he would go to seek it, witness replied that, if it was a question of a large increase, to the exclusion of the present sources, he should go nearly all over the Thames basin; and he was not sure that he would not go beyond it. Interrogated as to the water capacity of the greensand, he mentioned that there was hope of getting a good supplementary supply of water therefrom; but in the area of the Thames basin, with which he was best acquainted, the chalk was the great reservoir of water. In this respect it was far ahead of all other strata.

Re-examined by the CHAIRMAN, witness observed that heavy pumping from the chalk would affect the level of the water, not only below, but also above the point where the pumping took place. Taking a concrete instance, he said he thought the wells of the New River and East London Companies in the Lea Valley affected the flow of the streams or the level of the water in the chalk to the northward.

The Commission then adjourned till the next day.

The Acquisition of the Todmorden Gas-Works by the Local Board.—The Todmorden Local Board have finally decided to sign the necessary document for the purchase of the three gas-works in the district, and to promote a Bill in Parliament for that purpose.

New Water-Works for Stonehouse.—The Stonehouse Local Board last Thursday approved of a scheme propounded by Mr. E. Pritchard, M.Inst.C.E., for obtaining an independent water supply from the River Cad, at a cost of £28,500, and resolved to apply to Parliament in the coming session for the necessary powers.

Lighting of Canterbury Cathedral.—In future Canterbury Cathedral is to be lighted by the Gas Company, a supply from whose mains is now being laid on. Hitherto the gas by which the Cathedral and the Precincts have been illuminated has been manufactured by the employees of the Dean and Chapter at the Cathedral works.

The Quality of the South London Water Supply.—Acting under the instructions of the Sewers and Sanitary Committee of the Lambeth Vestry, Dr. Muter, the Public Analyst for Lambeth, has analyzed four samples of water taken from the mains of the Lambeth and the Southwark and Vauxhall Water Companies. In both instances the latter Company's water was of a pale yellow colour and slightly turbid; and the indicated degree of organic impurity was 0·370. The samples from the Lambeth Company's mains were yellow and slightly turbid; and the indicated degree of organic impurity was 0·398.

The Electric Light at the Smithfield Markets.—The Lord Mayor and the Lady Mayoress attended at Smithfield Markets last Friday evening to formally inaugurate the lighting of the markets by electricity, which has been carried out on behalf of the Corporation of London by Messrs. J. Sax and Co. There was a large attendance. The Lord Mayor said he thought the Corporation of London might be deservedly proud of being the first public body in the world to have its markets lighted by electricity. The number of incandescent lamps to be fitted on the premises of tenants in the markets reached 12,000, of from 15 to 50 candle power each; and the main avenues would be lighted with 100 lamps of 50-candle power each. The Lady Mayoress switched on the light.

THE SHEFFIELD CORPORATION WATER BILL.

A Meeting of Owners and Ratepayers was held at Sheffield on Monday last week, to sanction the promotion by the Corporation in the next session of Parliament of a local and personal Bill "to amend the provisions of the Sheffield Corporation Water Acts relating to the water-rents to be taken by the Corporation, and to extend the time limited by the Sheffield Water-Works Act, 1881, for the completion of certain reservoirs, and for other purposes." The Deputy-Mayor (Mr. Alderman Clegg) presided; and, in moving a resolution approving of the object for which the meeting had been called, he said the most important part of the Bill would be with reference to the additional 25 per cent. on the water-rents, the right to charge which expired in two years. If it were taken off, it would be a merely nominal reduction, because, when the Corporation purchased the water undertaking, it was enacted that they should pay the cost and interest on annuities, and so forth; and also provide for a sinking fund. The water undertaking had so far proved a great success; and he did not see that there was anything that the town had to regret in acquiring the works. The proposal of the Council was that one-half of the 25 per cent. should be taken off at the end of three years from the time when the Act which authorized it expired, and the other half of the 25 per cent. at a date not exceeding eight years from that period. This was considered to be the best and straightest way of doing the business. Alderman Gainsford formally seconded the resolution; and then Mr. Hall asked whether the 25 per cent. was not extended five years when the Act was obtained, and whether it was computed by any actuary that five years would be sufficient. The Deputy-Mayor said the calculations were on the basis that no sinking fund would be required; but they had had to pay £5000 a year for that, which upset the calculations. Mr. Hall remarked that he had no objection to vote for the resolution; but it seemed to him simply raising the extremely high rates under another name, and that the Council were afraid of facing the matter under its proper name as an increase of rates. The Deputy-Mayor replied that the Council must pay their debts; and the only difference between the Corporation and the Water Company was this—that under this Bill they would get rid of the 25 per cent. in a few years; while if the Company had once obtained their Bill, the ratepayers would have had to pay the 25 per cent. in perpetuity. The present Bill would lower the water-rents 12½ per cent. in three years. Alderman Gainsford said perhaps it would be better that he should explain the object of the Bill. In proposing the resolution in the Town Council in 1887 for the purchase of the water-works, he made use of these words: "He excluded altogether from the figures which he laid before the Council the charge for a sinking fund. He did this for two reasons. In the first place, because at that present moment they could not know what the charge for the sinking fund might be; and in the next place, because it was manifestly unfair in dealing with questions of income and revenue to bring the charge for the sinking fund, which was neither more nor less than the purchase by instalments of the freehold of the concern, into any such calculation with regard to revenue." When they came before the town in 1887, they altogether excluded from their calculations the question of a sinking fund. Of course, it was known that a sinking fund would have to be dealt with; but at that time it was not known what it would be. After the experience of five years, they were able to come before the ratepayers with proposals for establishing such a fund—proposals that would put the charge where, by Act of Parliament, it was bound to be—upon the revenue of the concern. The only other alternative would be to put it on the district rate; and to do that would be illegal. The right thing to be done was to take such measures as would supplement the natural legal revenue of the concern by a sufficient amount to enable it to cover the sinking fund. At the present moment they stood about £8000 better than was anticipated by the calculations in 1887; and the general result was that the whole purchase of the undertaking—amounting to about £2,300,000—would be provided for out of the natural revenue of the concern, excepting a sum during the next eleven years of £152,000. The object of the Bill was to give the Council this £152,000 in eleven years; and, with the exception of that sum, the whole of the £2,300,000 would be met out of revenue, exclusive of any 25 per cent. whatever. This was, he thought, a sufficiently favourable state of things to obtain the sanction of the ratepayers to the proposed Bill, and to justify the action of the Council in 1887. The resolution was carried, with only one dissentient.

Sale of the Sutton Coldfield Gas-Works.—The Sutton Coldfield Gas-Works were sold by auction, by Messrs. Lythall and Walters, last Tuesday. The buildings and land (3932 square yards) fetched £500; and the working plant realized £404. Altogether the works, mains, meters, &c., of the old Company have been disposed of at about £5600; £4500 having been paid by the Birmingham Corporation for the mains, &c., and the right of supplying the borough with gas.

A Retrospective Increase in the Price of Gas.—A question was raised at the last meeting of the Accrington Town Council by Mr. Dewhurst regarding the increase of 5d. per 1000 cubic feet in the price of gas in the town. He wished to know whether, seeing that the Company did not give notice of the advance in price until July 20, after the quarter had commenced, the consumers could be compelled to pay the additional charge. The Town Clerk explained that, though the accounts were dated from quarter to quarter, they were really made out from the time the state of the meters was taken; and it took the Company's servants a considerable time to make the round—in some cases the meters were not taken until six weeks after the expiration of the quarter. He was of opinion that, if the notice of the increase was not given before the state of the meters was taken at the beginning of the quarter, the Company could not compel consumers to pay the extra charge; but if the notice was given before the accounts began to run, then they could compel them. Mr. Dewhurst submitted that it was the duty of the Corporation to protect the ratepayers in this matter, and that they should fight the Company on the point. Mr. Sprake took the same view; but the Mayor disagreed with them, and the matter dropped.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

The Edinburgh and Leith Gas Commissioners had a field-day on Monday, for which Mr. W. Wells, of Leith, was responsible. It was Mr. Wells's last appearance as a Gas Commissioner; and he took advantage of the opportunity to go into questions which have been before the Commission during his term of office, and to leave the Commissioners a legacy of his opinions for their guidance when he is no longer in their midst. He spoke also as a disappointed man—as a man disappointed, for one thing, that he should be cut off from work which he takes a delight in; and for another, that it should not be either completed before he left or carried on after he did leave. This may account for a little of the acerbity which tinged his remarks; for he seemed to labour under the notion that there was, somehow, a sort of combination against him. In this I think he was right; but I venture the opinion that for it he had himself to blame, because of his attitude towards the officials. These gentlemen he did not scruple to accuse when occasion offered, and to accuse without effect, I suppose, because the Commissioners very properly look upon their officials as men who are as desirous to do their duty as they are themselves. There is no need to controvert Mr. Wells any further, for he has ceased to be a member of the Commission. He may, however, be heard of again, as, I understand, he made charges in Committee, against two of the servants of the Commission; and at the meeting on Monday, notice of motion was given, to the effect that he be called upon to substantiate his charges. Now that he has gone, it would seem to be imprudent to bring him back on the scene, unless the parties accused wish to have the matters referred to by Mr. Wells sifted to the bottom; and on their part, I should say they ought to be content with an investigation by a Committee, which would put the matter right.

The first business the Commissioners dealt with was that of the Surveyor's Department, regarding which there were more complaints last winter, and about which they have resolved—seeing the complaints were few—to say nothing more than that the Surveyors should be admonished to take the utmost care in future readings of meters.

Then they took up the subject of enriching coal gas with oil. This was Mr. Wells's opportunity. He had been delegated to conduct some experiments in the Leith works, and did so in April and May last. The Works Committee submitted Mr. Well's report *in extenso*—a long document with about 20 illustrations; and, by a majority, they recommended that the Commissioners should approve generally of the report, and have it printed and circulated among the Commissioners. It would be impossible, in these "Notes," to give even a summary of Mr. Wells's report; but there is the less need for this, in respect that he proceeded upon the same lines as all experimenters have done for the last 70 years, and arrived at no better result than they did. There is this also to be said on this part of the subject, that your readers will very soon have submitted to them the results of the new process which has been invented by Mr. W. Young, of Peebles, which altogether eclipses anything yet attained, and will throw existing processes out of existence. In fact, that was the reason the Commissioners, who know something of Mr. Young's experiments, upset the recommendation of the Committee, and resolved to go further with the work originated by Mr. Wells. Bailie Archibald urged the Commissioners, as he had urged the Works Committee, that they should thank Mr. Wells for the interest he had taken in the matter; and that it should be remitted to the Commissioners and the Engineers to make further investigations and experiments, if necessary. In this he was supported by the Chairman (Mr. Kinloch Anderson), who referred to Mr. Young's experiments, of which they expect to get the results soon. The Commissioners unanimously adopted Bailie Archibald's proposal. Mr. Wells then tabled a challenge upon the recommendation of the Works Committee to discharge a remit to them in November, 1891, to inquire into the cost of coal and gas in other towns as compared with Edinburgh. The remit was a foolish one at the time, because it placed the Commissioners on the list of those troublesome persons who send out begging circulars; and it was not long in existence, before it was discovered that all the information they required could be got from Field's "Analysis." Mr. Wells received no support in his demand for a report from the Committee; and the remit was discharged.

The next subject raised by Mr. Wells had reference to his proposal for the erection of experimental and new works. These, he thought, should go on, irrespective of the oil experiments. The Commissioners, however, resolved to take no action in the matter.

Mr. Wells then launched into the subject of the cost and quantity of gas manufactured at the two works during the year to May last. The Engineers submitted a detailed report on the subject, bringing out the results which have already been published. Mr. Wells found a weakness in the statement, in respect that it did not give the unaccounted-for gas. This, it was explained, both in a foot-note to the statement, and verbally, could not be done, because of the work which has been in progress up till now, of separating the districts. Mr. Wells wanted to know why the total of the two works could not be given; and threw out the remark that the unaccounted-for gas was "not the same as in any other part of the country." This was held to mean that it was much larger; but if this was so, his notion was soon dispelled. Mr. Gibb, the Treasurer, produced his ledger, and informed the Commissioners that last year the unaccounted-for gas in Edinburgh and Leith was 10·5 per cent., and in the preceding year, 9·116 per cent.; whereas in Glasgow, for the same year, as shown by Field's "Analysis," it was 10·95 per cent.

This exhausted Mr. Wells's subjects; and the only other business of interest before the Commission was a recommendation by the joint Finance and Works Committees that certain salaries should be increased. The recommendation was agreed to. Of those who receive an increase, Mr. Gibb, the Treasurer, gets £50; Mr. T. Scott, the chief clerk in the consumers' department, receives £40; and Mr. D. Schenck, of the pay department in the Edinburgh works, £30. Out of about 60 applications for increases of salary, 14 have been granted; and the total amount involved in the increases which have been agreed to, is £244 10s. a year. For some time, I have been afraid the Commissioners were drifting, in the matter of discipline in the office, because

they have been inclined to favour the creation of independent departments. In this they could not altogether help themselves, when it is remembered that they had, at the transfer, the difficult task of amalgamating the staffs of the two Companies. What they did then was right; and it is proper that the arrangements then made should continue till circumstances allow alterations to be made. They have, however, since added to the independent departments; and they were in danger of landing themselves in the position of having to manage a heterogeneous body of servants without a head. They ought to have a head to their staff; and I observe with pleasure that they have directed that the Treasurer, the natural head, shall be also the actual head of the staff. The Commissioners have also (although it does not appear in the minute) affirmed the principle which guided the old Companies—that they will, at intervals, consider and re-adjust the salaries of their staff, and that applications to them for increases must not be made.

Paisley is not to have electric lighting for some time yet, if it ever has it. The Town Council last year obtained a Provisional Order empowering them to establish a lighting scheme; and a Committee was then appointed to consider as to its establishment. The Committee reported to the Council yesterday that the probable demand for the electric light was not sufficient to warrant the expenditure involved; and they therefore did not see their way to recommend the Council to proceed with the laying down of an installation under the Order. When the report was submitted, the Council had a conversation upon a proposal to get an extension of time under their Order. This, they had been advised, was impracticable, except by getting another Order; but it was expected that, if application were made to the Board of Trade, and no objection were taken by other parties, the Board might defer revocation of the Order for another twelvemonth. The Committee were asked to consider this proposal.

The Paisley Gas Corporation yesterday resolved to enter upon a sounder financial policy than they have hitherto followed. Their practice has been to place £500 of profits to sinking fund, and £500 to contingent fund, and to hand the balance, after defraying the cost of small extensions, over to the town. I suppose it is still their intention to give their surpluses to the town; but in future these will be less, because it has been decided that contributions to the sinking fund be not less than £1000 a year, that interest be accumulated upon it, and that not less than £1000 be annually written off for depreciation. This has been resolved upon in connection with the proposed loan of £20,000 for extensions. The way I look at the matter is that, if £1000 a year set apart was sufficient when the debt upon the undertaking was over £75,000, more than £2000 a year is not required for a debt which will not be above £95,000. Of course, the view taken is, that the sums hitherto set apart have not been sufficient; and the new arrangement is to remedy the defect. It is a sounder and wiser policy.

The municipal elections are over; and the new bodies are constituted and ready for work. So far as I have observed, the gas industry will not be much affected by this year's elections; but it is too early yet to know. In one place, it will be affected, and that is in Aberdeen, where, I observe with the utmost satisfaction, Mr. Adam Pratt has not been elected to the Town Council. The Dundee Gas Commission is in process of being re-constituted. Yesterday the Chamber of Commerce elected their five representatives to the Commission; and, as is usual on such occasions, the retiring representatives treated the body to some sort of narrative of how they had conducted themselves during the year. There is a very noticeable difference between the attitude which one assumes when he is seeking his election and when he is giving an account of his work. Prior to election, the speaker is to do great things if he be elected. At the conclusion of his term of office, the story is all about what "we" have done. Mr. H. Robertson, one of the representatives of the Chamber on the Gas Commission, took a middle course. He did not put himself forward, neither did he claim for the whole Commission any benefits which may arise from their policy; but he put forward a claim for good management on behalf of the representatives of the Chamber. It was under their influence, he said, that the sinking fund was now allowed to enjoy its own interest—the result of which was that last year a sum of £862 accrued to the fund from that source. They had also stopped the practice of expending the contingent fund upon renewals and repairs, and had raised that fund from a deficit of £450 to a balance of £540. It is his opinion that, if these two funds were continued on the same lines, the debt of £385,000 which now stands against the Gas Commission would be extinguished in about 30 years. Probably before that time, he thought, there would be a great extension of electric lighting. I suppose the latter motion was brought in as a reason why they should hurry up and get the Gas Commission debt extinguished. It, however, served as a peg on which to hang a neat laudation of the Dundee electric light installation, from which it is somewhat difficult to say whether appreciation is more deserved by Mr. Brownlee, the Superintendent, or the city of Dundee for its enterprise in going in for the work. I presume it is Mr. Brownlee; because what he claimed for the city was, not that it had made a good bargain, or was doing a good thing for the community, but that it was likely to be the first town in Scotland in which the electric light would be established. This is not yet a realized fact; for there is a sort of race in this respect between Glasgow and Dundee, which is not yet decided. According to Mr. Robertson, it is appropriate that Dundee should be first, as it was there that Mr. J. B. Lindsay "produced the first electric light that, he believed, was produced by any human being." Mr. Lindsay is the gentleman whose name was mentioned by Dr. Keiller, at the recent Edinburgh meeting of the British Association, as being the discoverer of electric lighting. It was Dr. Keiller's intention to bring out the claim of Mr. Lindsay to be the first in the field; but since he uttered those words death has taken him away, and his task must be undertaken by another. Mr. Robertson has got hold of the subject; and he may do something with it. A colleague of Mr. Robertson's, Mr. R. O. Parker, stated, in his valedictory address, 'that they (he should have said Mr. M'Crae, the Manager) had raised the illuminating power of the gas from a little over 20 to not less than 25 or 26 candles; and that they had applications "equal to about 1000 lights of 16-candle power" in connection with their electric lighting installation, which was about a fifth or a sixth of what they could produce. Neither of the gentlemen sought re-election.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Nov.* 5.

Sulphate of Ammonia.—The market has been wearing a calmer aspect; but the demand continues good, although to the superficial observer it may not appear so. The fact is that buyers of all sorts, while professing indifference to buying, and predicting a decline, are most eagerly picking up suitable parcels at extreme rates. Prices are, therefore, fully maintained; and the second-hand parcels which are said to be changing hands are either mere baits, or cannot be relied upon as correct. Quotations are £10 2s. 6d. all round; the second-hand business being reported at £10. There is no change in the general position; and the shipments and home deliveries satisfactorily prove that the production is being all taken up. Nitrate remains firm; and consumers are beginning to have greater confidence in the future. Perhaps it is as well to remind consumers that nitrate at present prices costs fully 11s. 6d. per unit of nitrogen; while sulphate, at to-day's value, represents only 10s. per unit—a fact which must speak for itself.

LONDON, *Nov.* 5.

Tar Products.—This market continues lifeless, and even depressed. Benzols are extremely dull, with a tendency to drop in price. Pitch cannot be said to be anything like so firm; and buyers are looking for lower prices. The formation of a Tar Sales Committee among tar distillers has somewhat strengthened anthracene; but purchasers hold aloof. Creosote and common oils are unsaleable; and burning on a very large scale is being resorted to. Unfortunately this leaves a poor and unprofitable price for them. Prices are as follows: Tar, 10s. Pitch, 27s. 6d. Benzols, 90's, 1s. 6d.; 50's, 1s. 3½d. Toluol, 1s. 2d. Solvent naphtha, 1s. 1d. Crude benzol naphtha, 30 per cent., 7½d. Creosote, 1¼d. Creosote salts, 20s. Pressed naphthalene, 45s. Carbolic acid, 60's, 1s. 3d.; 70's, 1s. 7d.; crystals, 5½d. Cresol, 10½d. Anthracene, 30 per cent., "A" quality, 10½d.; "B" quality, 8d.

Sulphate of Ammonia.—Better business is reported in sulphate; and notwithstanding all the efforts to "bear," it fairly maintains its position. There is an excellent inquiry from all kinds of sources; and the price for forward delivery is certain not to be worse than to-day. Business has been noted at prices ranging from £10 to £10 2s. 6d., less 3¼ per cent. discount. Gas liquor is quoted at 6s. to 7s. per ton.

COAL TRADE REPORTS.

Lancashire Coal Trade.—So far as the better qualities of round coal are concerned, a generally active demand is reported throughout the district; and, though there are very few of the pits that are working more than five days per week, the present output is moving away readily. With the commencement of the month, there has been a more or less general hardening up of prices to the full rates ruling last winter, which, in many cases, has represented an advance of 6d. to 1s. per ton. This upward movement has, however, been strictly confined to those collieries which have made concessions during the summer months—the firms who have maintained their rates all through, making no change in their prices. At the pit mouth, best Wigan Arley coal now averages 12s. 6d., with 13s. quoted in one or two instances; Pemberton four-feet and second qualities of Arley, 10s. 6d.; and common house-fire coals, at 9s. per ton. With regard to other descriptions of fuel, there is no material change to notice. Common round coals continue in only very limited request; and the only increased demand for these is where they are going away for common house-fire requirements. Supplies are still more or less a drug in the market; and 7s. 6d. represents the full average figure obtainable for ordinary descriptions of steam coal, with sellers in many cases at under this figure, to effect prompt clearances of quantities. The shipping demand has perhaps been rather better, and there has not been so much pressure of surplus supplies at the ports on the Mersey, with the result that ordinary qualities of steam coal are now steady at about 8s. 6d. to 8s. 9d., delivered at the Garston Docks, or the High Level, Liverpool. Engine fuel has been moving off rather better; but supplies are still fairly plentiful, and buyers continue to cover only immediate requirements. Prices are steady at late rates, burgy averaging 6s. to 6s. 3d.; best slack, 5s. to 5s. 3d.; medium, 4s. to 4s. 3d.; and common, about 3s. 6d. per ton, at the pit mouth.

Northern Coal Trade.—There has been a rather firmer tone in the coal trade of the North during the last few days, the shipments being heavier and the inland consumption having increased. Best Northumbrian steam coal is now generally in steady request, at about 9s. 6d. per ton f.o.b., though in one or two cases there has been a slightly lower price accepted, to enable collieries to work full time. For second qualities of steam coal, the demand is scarcely adequate to the supply; and the general price asked is 9s. per ton, with a discount as high as 5 per cent., in one instance at least. Small steam coal is 3s. 9d. to 4s. 3d. per ton; and this is fairly well taken up by the demand. Bunker coals are depressed; as low as 6s. 10d. per ton having been accepted. For gas coals, the demand is now rapidly rising to its highest pitch; but the production has been enough to meet the requirements with fair rapidity. The chief gas coal collieries have now abundant work; and though the rates have not risen yet, a week of fog or storm would very speedily have an effect on the price. At present, for odd cargoes, the range of quotations is from 7s. 6d. to 8s. 6d. per ton. Contracts are being settled, however, at prices about 6s. 10d. or 6s. 10½d. per ton. Household coals are very dull, the demand being less than usual at this time. Manufacturing coals are quiet; though some important contracts over next year are being settled now at reduced prices. In coke, there are fair demands from both the local furnaces and those in the north-west; but the shipments seem less than a year ago. The price at the local furnaces is about 13s. 6d. For shipment, 15s. to 15s. 6d. are the current quotations. Gas coke is rather steadier—there being some orders for export, with rather limited stocks just now, despite a large production.

Scotch Coal Trade.—Shipments are still the backbone of the trade. These continue to be very large, two reasons for which are given—first, that freights are so low that coalmasters here are able to compete

with Continental dealers; and, second, that there has been a rush to get away as many cargoes as possible before the higher rates of insurance, which come in force this month, begin to take effect. The total shipments reported for the week amount to 175,563 tons—an increase upon the preceding six days of 2656 tons, and upon the corresponding week of last year of 39,747 tons. For the year to date, the total export has been 6,418,047 tons—an increase over the exports for the same period of last year, of no less than 818,306 tons. In the home trade, though there is now more doing for domestic sorts, consequent upon the colder weather, for factory purposes the market is very dull. The severe drop in prices in the North of England is leading to some orders going thither—probably from those who were driven to Scotland during the time of the Durham strike. Main coal has been most in demand; and it has slightly improved in price. The prices quoted are: Main, 7s.; ell, 8s. to 8s. 3d.; splint, 7s. 6d. to 7s. 9d.; and steam, 9s. 6d. to 9s. 9d. per ton.

Alleged Defalcations by the Secretary of the East Ardsley Gas Company.—Mr. G. H. Tomlinson, for some years Secretary of the East Ardsley Gas Company, has lately disappeared. On the 24th ult., he was suspended; and subsequent events led to a warrant being issued for his apprehension. It appears that he has largely speculated on the turf. An independent auditor has been called in; and an exhaustive examination of the books is being made.

Gas-Making Plant at the Grassmoor Colliery.—We are informed that the Grassmoor Colliery Company, Limited (who own extensive collieries near Chesterfield, capable of producing 350,000 tons of gas coal per annum, in addition to their large output of house coal) have laid down gas-making plant, replete with all the latest improvements. The new works have been erected to supply light in their numerous pits, workshops, and offices; and not the least important—for their screens and picking bands. After carefully considering the relative merits of gas and electricity, alike as regards cost, applicability for effectually freeing the coal from impurities, and convenience of distribution, the Company decided in favour of the former method of lighting. The plant will also be utilized experimentally, with the object of maintaining uniformity in the quality of their gas coal.

The Chatham Town Council and the Water-Works.—At a special meeting of the Chatham Town Council last Wednesday, the Mayor complained of the refusal of the Directors of the Water Company to receive a deputation respecting the proposed purchase of the undertaking. He said that certain overtures would have been made to the Directors, who might have been offered half-a-million of money. They might also have been asked to reduce the price of water 25 per cent., in consideration of the Council not proceeding with the matter for some years. As, however, they had refused to receive the deputation, it was unnecessary for the Council to disclose their plans. Alderman Wood defended the Directors, and said they also had plans which they were not desirous of disclosing, though he might mention that they had been considering the advisability of reducing the water-rate, after the completion of the improvements to the works. On the initiative of the Mayor (Mr. C. T. Smith), it was resolved to promote a Bill next session to carry out the object of the Corporation.

Inauguration of a New Gasholder at Penrith.—Last Thursday the new gasholder on Mr. Gadd's spiral system, which has been erected at the gas-works of the Penrith Local Board by Messrs. R. and J. Dempster, of Newton Heath, Manchester (the tank having been built by Mr. W. Grisenthwaite, of Penrith), under the supervision of Mr. Joseph Hepworth, M.Inst.C.E., Gas and Water Engineer of the Carlisle Corporation, was formally inaugurated. Mr. Hepworth was present on the occasion, and furnished some particulars as to the tank and holder. The former is 75 feet in diameter and 25 feet deep, and is of cement concrete. It is the fourth of its kind constructed in Cumberland since concrete was introduced for the purpose; the others being at Carlisle, Cockermouth, and Keswick. The capacity of the holder is 200,000 cubic feet. Mr. Hepworth complimented both contractors highly on the way in which they had carried out their work. The Board could not, he said, have found a better man for the tank; and the holder was as perfect as ever he had seen one. The ceremony of turning the gas into the mains was performed by the Chairman of the Local Board (Mr. Sweeten), in the presence of a large company, which included the Manager (Mr. E. Shaul), the Clerk (Mr. G. Wainwright), and several gas managers from neighbouring towns. It was followed by a luncheon, at which complimentary toasts were duly honoured.

Longton Corporation Gas Supply.—The report of the Engineer and Secretary of the Longton Corporation Gas Department (Mr. W. W. Hulse) for the year ending June 30 last, came before the Gas Committee at a meeting held on the 28th ult. We learn therefrom that there was an increase of 3,080,100 cubic feet in the quantity of gas sold in the twelve months; the revenue from private rental showing an advance of £425, and public lighting one of £37—making together £462. This, however, is brought down to £297 by the reduction of £165 in the amount received for the rental of meters. The augmented consumption of gas took place in the first three quarters of the year. The sale of residuals yielded an increase of £6 3s. 1d., caused by the higher price obtained for tar. On the other hand, the revenue from coke and ammoniacal liquor was less by £98 17s. 6d. and £57 4s. 10d. respectively. Plant has now been erected for working up the liquor into sulphate. The tar contract has been renewed, but at a considerably reduced figure. The expenditure for coal was less last year by £170 than in the previous period, notwithstanding that an increased quantity was used. During the past year a reserve fund was created; the amount now standing to its credit being £228. The gross profit on the year's working was £7671; the net profit, £2529. This sum has been paid over to the credit of the borough fund; the total amount added thereto, in relief of the rates, since the purchase of the gas-works by the Corporation being £36,040. Meter-rents were abolished on the 1st of April last; and, to facilitate the use of gas by small consumers, prepayment meters are to be introduced. The unaccounted-for gas last year was at the rate of 8·18 per cent. The report was adopted.

The Petroleum Trade.—The Standard Oil Company of America last Friday intimated their withdrawal from the combination which has existed several years between them and the Scotch oil producers for the regulation of the prices of the paraffin scale. They have followed this up by a further reduction in price. This also practically brings to an end the combination amongst Scotch companies.

The Proposed Electric Lighting Scheme of the County Council.—At the meeting of the London County Council last Tuesday, it was referred to the Parliamentary Committee, on the recommendation of the Highways Committee, to take the necessary measures to obtain the sanction of Parliament in the next session to the carrying out of the electric light installation on the Victoria Embankment, its parks and gardens, and the Westminster and Waterloo Bridges. It was originally thought that the Council had already general powers for the above purpose; but, as doubt has been raised on the point, it has been deemed advisable to seek special authority.

Heywood Corporation Gas Supply.—At the last meeting of the Heywood Town Council, the Chairman of the Gas Committee (Mr. Lawton) commented on the increase in the consumption of gas in the borough. In the past quarter the consumption was 11,210,000 cubic feet, as compared with 8,473,000 cubic feet in the corresponding quarter of last year. This was, he remarked, very satisfactory, particularly as it evidenced a considerable use of gas for purposes other than lighting. The increase in the consumption for heating and motive power was 591,000 cubic feet. In the half year ending in September, there was a total increase of 4 million cubic feet; and he hoped the result of the year's working would be of a satisfactory nature. Mr. Greenhalgh subsequently suggested that the Gas Committee should supply gas for street lighting at 2s. per 1000 cubic feet. Mr. Hodgkinson replied that Mr. Greenhalgh was inconsistent. Although he strongly advocated selling gas for the street lamps at a cheaper rate, he was as strongly opposed to applying the profits made by the Gas Department to the reduction of the rates. There was no difference in principle between contributing £300 to the reduction of the rates and taking £300 from the profits to sell gas at a lower price for street lighting. On this, the question dropped.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

(For Stock Market Intelligence, see ante, p. 808.)

Issue.	Share	When ex-Dividend.	Dividend or Div. Bonus.	NAME	Paid per Share	Closing Prices	Rise or Fall in Wk.	Yield upon investment.
£			p. c.	GAS COMPANIES.				£ s. d.
590,000	10	14 Oct.	10½	Alliance & Dublin 10 p. c.	10	16–17	..	6 3 6
100,000	10	,,	7½	Do. 7 p. c	10	10½–11½	..	6 10 5
300,000	100	1 July	5	Australian (Sydney) 5 % Deb.	100	105–107	..	4 13 4
100,000	20	27 May	8	Bahia, Limited	20	11–12	..	13 6 8
200,000	5	12 May	7½	Bombay, Limited	5	6–6½	..	5 15 9
40,000	5	,,	7½	Do. New	4	4–4½	..	6 13 4
380,000	Stck.	12 Aug.	12½	Brentford Consolidated	100	212–217	..	5 10 7
150,000	,,	,,	9½	Do. New	100	163–168	..	5 10 1
220,000	20	15 Sept.	11½	Brighton & Hove Original	20	40–42	..	5 9 6
888,500	Stck.	31 Aug.	5	Bristol	100	104–108	+1½	4 12 7
320,000	20	29 Sept	11½	British	20	41–43	−1	5 4 8
50,000	10	31 Aug.	11½	Bromley, Ordinary 10 p. c.	10	19–20	..	5 15 0
51,510	10	,,	8½	Do. 7 p. c.	10	14½–15½	..	5 9 8
328,750	10	—	—	Buenos Ayres (New) Limited	10	7–8	..	—
200,000	100	1 July	6	Do. 6 p. c. Deb.	100	97–100	..	6 0 0
150,000	20	12 Aug.	8	Cagliari, Limited	20	25–27	..	5 18 6
550,000	Stck.	14 Oct.	13	Commercial, Old Stock	100	232–237	..	5 9 8
165,000	,,	,,	10	Do. New do.	100	180–185	..	5 8 1
160,762	,,	15 June	4½	Do. 4½ p. c. Deb. do.	100	123–128	..	3 10 4
800,000	Stck.	15 June	10	Continental Union, Limited	100	227–232	..	4 6 2
200,000	,,	,,	7	Do. 7 p. c. Pref.	100	190–195	..	5 2 7
75,000	Stck.	15 Sept.	10	Crystal Palace District	100	185–190	..	5 5 3
486,090	10	28 July	10	European, Limited	10	19½–20½	..	4 17 7
354,060	10	,,	10	Do. Partly paid	7½	14–15	..	5 0 0
5,470,820	Stck.	12 Aug.	12	Gaslight & Coke, A, Ordinary	100	217–222	..	5 8 1
100,000	,,	,,	4	Do. B, 4 p. c. max.	100	95–98	..	4 1 7
665,000	,,	,,	10	Do. C, D, & E, 10 p.c. Pf.	100	257–262	..	3 16 3
30,000	,,	,,	5	Do. F, 5 p. c. Prf.	100	116–121	..	4 2 7
60,000	,,	,,	7½	Do. G, 7½ p. c. do.	100	166–171	..	4 7 8
1,300,000	,,	,,	7	Do. H, 7 p. c. max.	100	162–167	..	4 3 10
463,000	,,	,,	10	Do. J, 10 p. c. Prf.	100	255–260	..	3 16 11
476,000	,,	,,	6	Do. K, 6 p. c. Prf.	100	150–154	..	3 17 11
1,061,150	,,	15 June	4	Do. 4 p. c. Deb. Stk.	100	118–121	..	3 6 1
294,850	,,	,,	4½	Do. 4½ p. c. do.	100	123–127	..	3 10 10
908,000	,,	,,	6	Do. 6 p. c. do	100	165–170	+1	3 10 6
3,800,000	Stck.	12 May	12	Imperial Continental	100	227–230	−1	5 4 4
75,000	5	15 June	6	Malta & Mediterranean, Ltd.	5	4–4½	..	6 13 4
560,000	100	1 Oct.	5	Met. of Melbourne, 5p. c. Deb.	100	106–108	..	4 12 7
541,920	20	15 June	5	Monte Video, Limited	20	14–15	..	6 13 4
150,000	5	27 May	10	Oriental, Limited	5	8½–8¾	..	5 14 3
60,000	5	29 Sept.	7	Ottoman, Limited	5	4–5	..	7 0 0
166,870	10	—	2	Pará Limited	10	2–3	..	—
420,000	100	2 Nov.	6	People's Gas of Chicago—1st Mtg. Bds.	100	103–107*	..	5 12 1
500,000	100	1 June	6	2nd Do.	100	104–106	..	5 13 2
150,000	10	—	10	San Paulo, Limited	10	8¾–9¾	..	—
500,000	Stck.	31 Aug.	15½	South Metropolitan, A Stock	100	287–292	..	5 6 2
1,350,000	,,	,,	12	Do. B do.	100	232–237	..	5 1 3
230,000	,,	,,	13	Do. C do.	100	240–245	..	5 6 1
725,000	,,	14 July	5	Do. 5 p. c. Deb. Stk.	100	140–144	..	3 9 6
60,000	Stck.	31 Aug.	11½	Tottenham & Edm'nton, "A"	100	225–230	..	5 0 0
				WATER COMPANIES.				
743,052	Stck.	1 July	10	Chelsea, Ordinary	100	245–250	..	4 0 0
1,720,252	Stck.	14 Oct.	8	East London, Ordinary	100	197–202	..	3 19 2
544,440	,,	1 July	4½	Do. 4½ p. c. Deb. Stk.	100	140–144	..	3 2 6
700,000	50	1 July	8½	Grand Junction	50	102–107	..	3 19 5
708,000	Stck.	12 Aug.	11	Kent	100	264–269	..	4 1 9
1,043,800	100	1 July	9½	Lambeth, 10 p. c. max.	100	215–220	..	4 6 4
406,200	100	,,	7½	Do. 7½ p. c. max.	100	190–194	..	3 17 3
279,700	Stck.	29 Sept.	4	Do. 4 p. c. Deb. Stk.	100	122–125	..	3 4 0
500,000	100	12 Aug.	12½	New River, New Shares	100	320–330	..	3 13 6
1,000,000	Stck.	28 July	4	Do. 4 p. c. Deb. Stk	100	128–132	..	3 0 7
902,300	Stck.	15 June	6½	S'thwk & V'xhall, 10 p. c. max.	100	146–149	−1	4 7 3
126,500	100	,,	6½	Do. D 7½ p. c. do.	100	134–138	..	4 14 3
1,155,066	Stck.	15 June	10	West Middlesex	100	240–245	..	4 1 7

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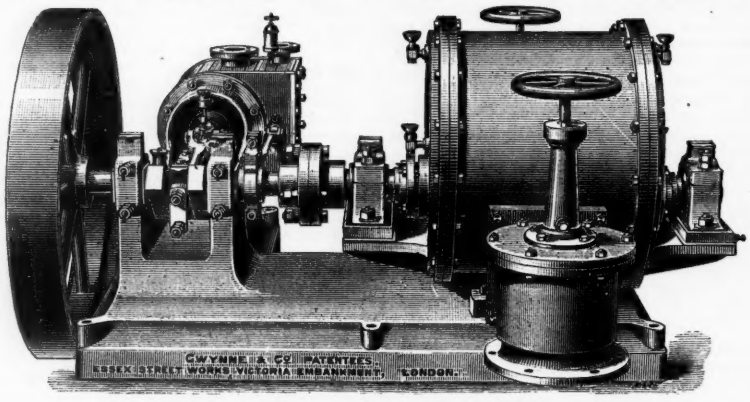

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THE Knutsford Light and Water Com- pany invite TENDERS for their production of AMMONIACAL LIQUOR for a period of One Year from the 1st of November inst.
The Company do not bind themselves to accept the highest or any tender.
Tenders to be sent in not later than the 16th inst. to the CHAIRMAN of the Company.

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THE Gas Committee of the above Borough are prepared to receive TENDERS for a TOWER SCRUBBER, about 70 ft. by 12 ft.
Further information can be obtained on application to Mr. W. S. Haddock, Engineer, Gas-Works.
Sealed tenders, endorsed, must be addressed to the Chairman, and sent in not later than the 21st inst.
FREDK. TAYLOR,
Secretary.
Gas Offices, Warrington,
Nov. 4, 1892.

COUNTY BOROUGH OF BURY.

TO IRON ROOF AND GIRDER MAKERS.

THE Gas Committee of the Corporation of Bury invite TENDERS for the making and erecting of IRON ROOF COLUMNS and GIRDERS in connection with their Coal-Stores at the Gas-Works, Elton, pursuant to the Drawings and Specification prepared by Mr. W. H. S. Gendall, Gas Engineer, from whom further particulars may be obtained, and also Copies of the Specification, with Quantities and Form of Tender, on payment of Two Guineas, which sum will be returned upon receipt of a *bonâ fide* Tender.
Tenders, endorsed "Tender for Iron Roof," to be sent to me, the undersigned, on or before Monday, Nov. 21, 1892.
JOHN HASLAM,
Town Clerk.
Corporation Offices, Bury,
Nov. 2, 1892.

MONTE VIDEO GAS COMPANY, LIMITED.

NOTICE is hereby given, that the BOOKS for the TRANSFER OF SHARES WILL BE CLOSED from Monday, the 14th of November, to Saturday, the 26th of November, 1892, both days inclusive, for the preparation and issue of Warrants in payment of an Interim Dividend for the Half Year ended the 30th of June, 1892.
By order of the Board,
A. G. HOUNSHAM,
Secretary.
Offices of the Company: Suffolk House,
Laurence Pountney Hill, Cannon Street,
London, E.C., Nov. 2, 1892.

EAST LONDON WATER-WORKS COMPANY.

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NOTICE is hereby given, that the Di- rectors are prepared to receive TENDERS for £25,000, being the fifth portion of the New Perpetual Debenture Stock of the Company, to bear Interest at 4½ per cent. per annum, free of Income-Tax, such tenders to be delivered at the Company's Offices, St. Helen's Place, in the City of London, not later than Twelve o'clock Noon, on the 13th day of December, 1892, and payment of accepted tenders made on the 23rd of December.
Particulars and Conditions, together with Form of Tender, may be obtained at the said Offices, or will be forwarded on application.
By order of the Court of Directors,
ISAAC ADOLPHUS CROOKENDEN,
Secretary.
St. Helen's Place, London,
Nov. 5, 1892.

IMPERIAL CONTINENTAL GAS ASSOCIATION.
INCORPORATED BY ACT OF PARLIAMENT.

NOTICE is hereby given, that the HALF-YEARLY ORDINARY GENERAL MEETING of the Proprietors of this Association was held at the City Terminus Hotel, Cannon Street, London, on Tuesday, the 1st inst.,
Sir JULIAN GOLDSMID, Bart., M.P., in the Chair, when the following RESOLUTIONS were unanimously passed:—
That the Report of the Directors upon the affairs of the Association be received, adopted, and entered upon the Minutes.
That a Dividend of £5 per cent. for the Half Year ended the 30th of June last, and a Bonus of £1 per cent. be declared upon the £3,800,000 Stock of the Association, and that the same be payable, free of Income-Tax, on and after the 1st of December next.
That the cordial thanks of the Meeting be given to the Directors for their able management of the affairs of the Association; to the Chairman for his conduct in the Chair this day; to the Secretary and the London Staff, and to Mr. H. V. Lindon, the Agents, Engineers, and other Officers of the Association on the Continent.
By order of the Board,
R. S. GARDINER,
Secretary.
21, Austin Friars, London, E.C.,
Nov. 2, 1892.

BRIGHTON AND HOVE GENERAL GAS COMPANY.
INCORPORATED BY ACT OF PARLIAMENT.

SALE OF SHARES.

MESSRS. G. A. WILKINSON & SON (in conjunction with Messrs. Wilkinson, Son, and Welch, of Brighton) are instructed by the Directors of the Brighton and Hove General Gas Company to SELL BY AUCTION, at the Mart, Tokenhouse Yard, City, on Wednesday, the 23rd of November, 1892, at Two o'clock precisely, 625 SEVEN PER CENT. "A" ORDINARY SHARES OF £20 each in the above Company, in 125 lots, being five Shares in each lot.
The Sale is made under the provisions of the Company's Act of 1879.
Particulars and Conditions of Sale, with a copy of the audited Accounts for 1891, may be had at the COMPANY'S OFFICES, 5, Great Winchester Street, Old Broad Street, LONDON, E.C., and 77, West Street, BRIGHTON; of Messrs. HOWLETT AND CLARKE, Solicitors, 8, Ship Street, BRIGHTON; of Mr. RALPH HOMAN, Stock and Share Broker, 2, Austin Friars, LONDON, E.C.; of Messrs. WILKINSON, SON, AND WELCH, Auctioneers, 168, North Street, BRIGHTON; of Messrs. G. A. WILKINSON AND SON, Land Agents and Auctioneers, 7, Poultry, LONDON, E.C.
W. H. HARDY, Secretary.

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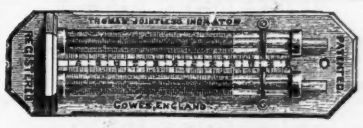

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Compiled and arranged by **ALFRED LASS,** Fellow of the Institute of Chartered Accountants.

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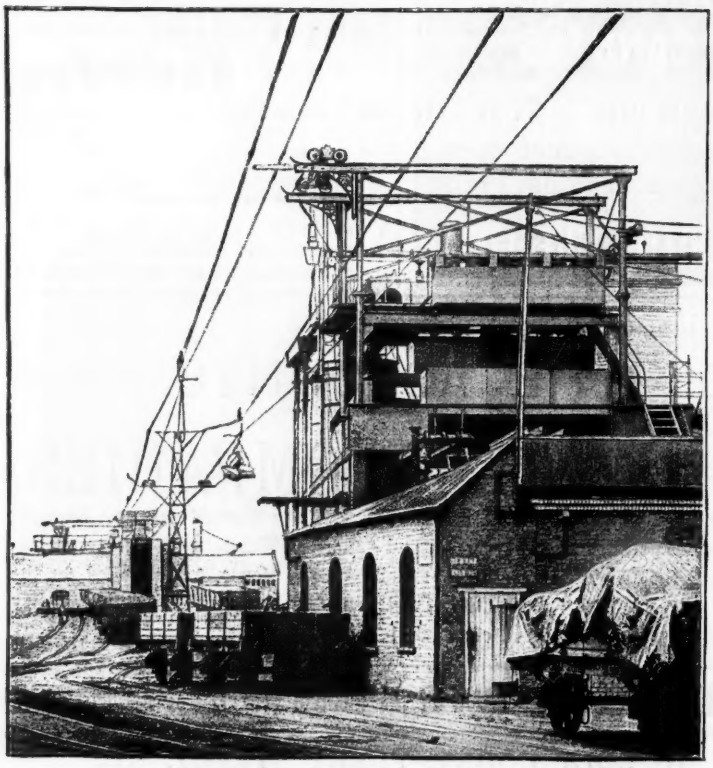

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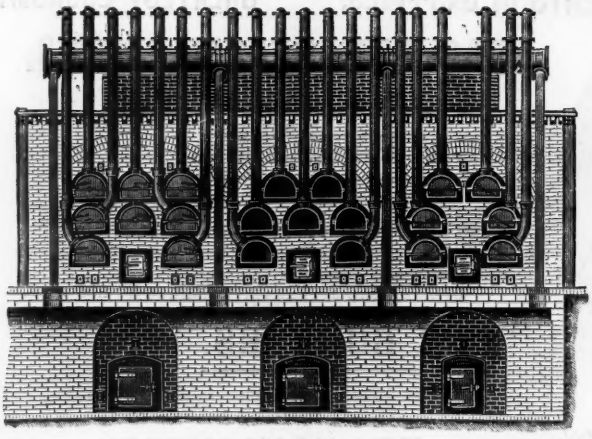

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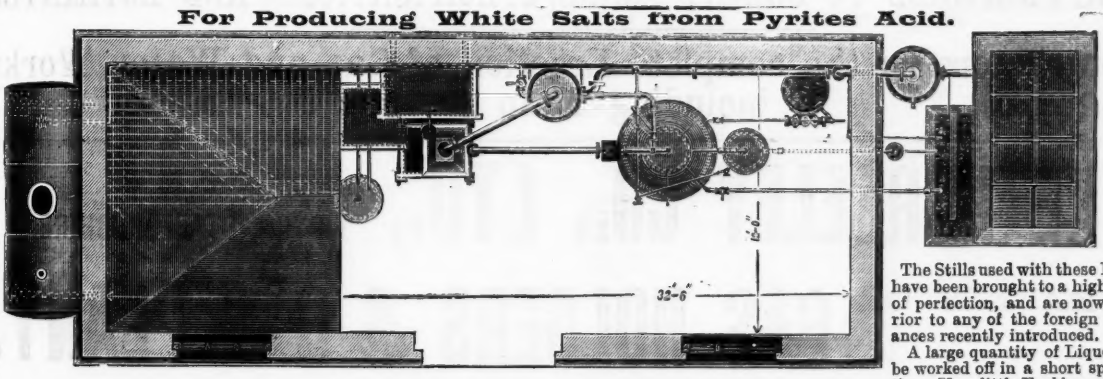

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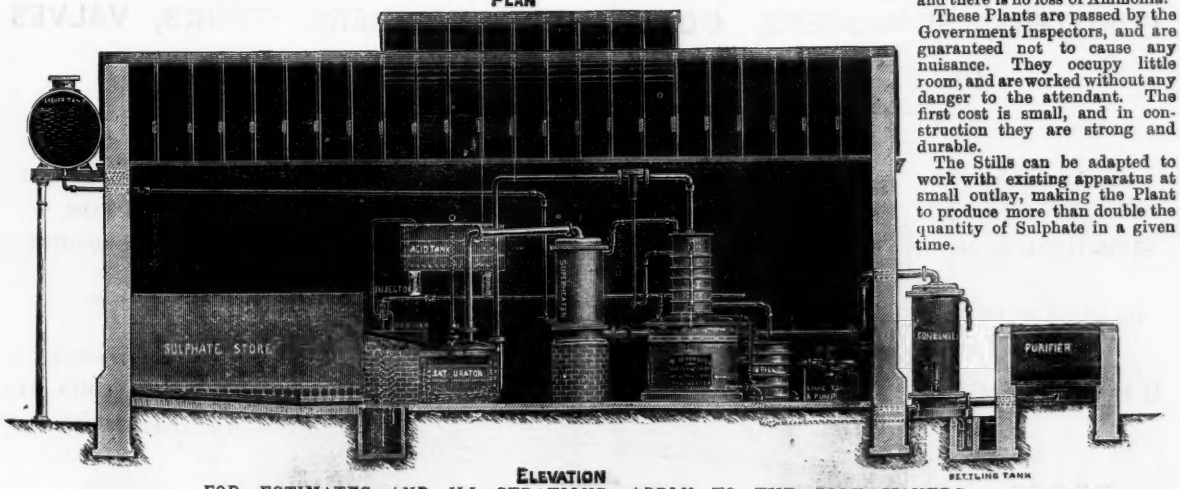

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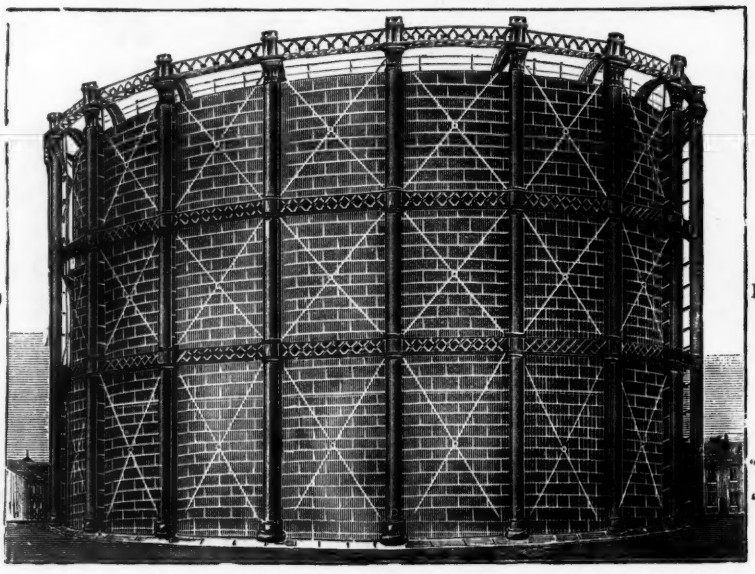

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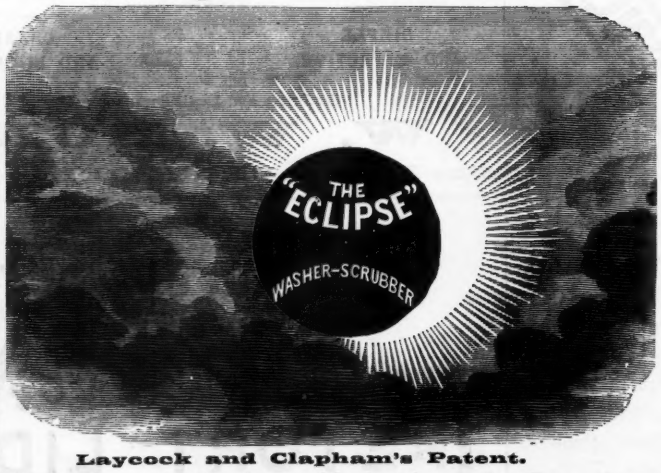

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